WOODEN SHIPS THAT ARE PROFITABLE TO-DAY

NEW YORK SEATTLE

MOTORSHIP

Devoted to Commercial and Naval Motor Vessels

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MORE ON THE FUEL-OIL QUESTION

EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

MOTORSHIP

(Trade Mark Registered)

PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

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(Cable Address—Freemote, New York)

Steamship Performances Excelled by American Motorship

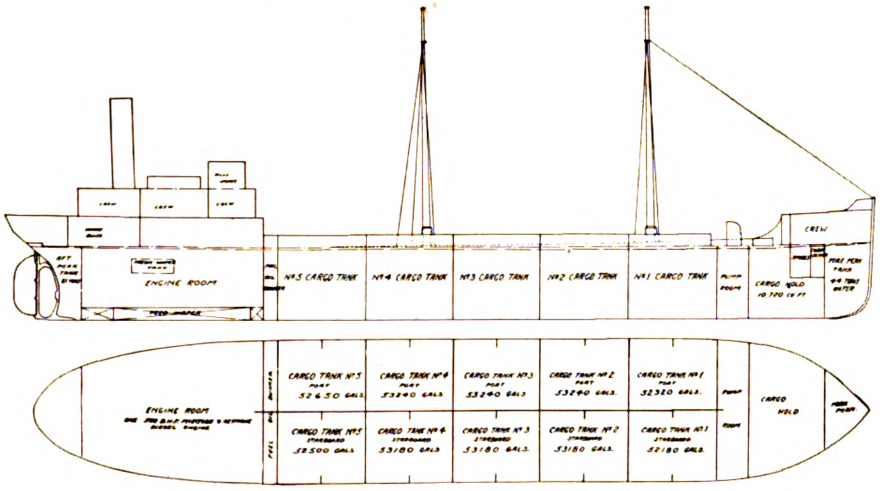
Vacuum Oil Single-Screw Tanker "Bayonne" Propelled by a McIntosh & Seymour Diesel-Engine, Completes 145 Uninterrupted Round Voyages—Operates on 14 to 15 Degrees Baumé Fuel-Oil—Has Cruised 62,350 Miles on 690 Tons of Fuel

BETWEEN the two greatest ports in the United States an "All-American" motor-tanker has been operating during the last three years with a regularity and reliability that could not be bettered by any class of vessel. And shipowners of these two ports have in her—right at their very portals—a ship that indisputably demonstrates that America can build and operate Diesel-driven craft second to none.

We refer to the Vacuum Oil Co.'s tanker "Bayonne," and those who regularly follow the movements of shipping must be impressed with the consistency with which this vessel enters and leaves the ports of New York and Philadelphia. No steam-vessel could operate with more clock-like precision than she does, which is naturally a source of gratification both to the owners and to McIntosh & Seymour, of Auburn, who built the Diesel-engine which makes this service possible.

In our September, 1919, issue we described and illustrated this vessel, the principal particulars of which are as follows:

Designers..Kindlund & Drake, N. Y. C.
Deadweight capacity..1,750 tons
Net cargo-capacity...1,700 tons
Length (O.A.).........216′ 7″
Length (B.P.)..........208′ 0″
Breadth (M.D.)........ 35′ 6″
Depth (M.D.).......................17′ 4″
Draft (Mean).......................15′ 3″
Power.........................500 shaft h.p.
Fuel-oil bunker-capacity.............54 tons
Daily fuel consumption (main engine).2½ tons
Daily lubricating oil consumption (main engine) ....2½ gallons
Daily fuel consumption (donkey boiler).½ ton
Average speed (loaded)...........8½ knots

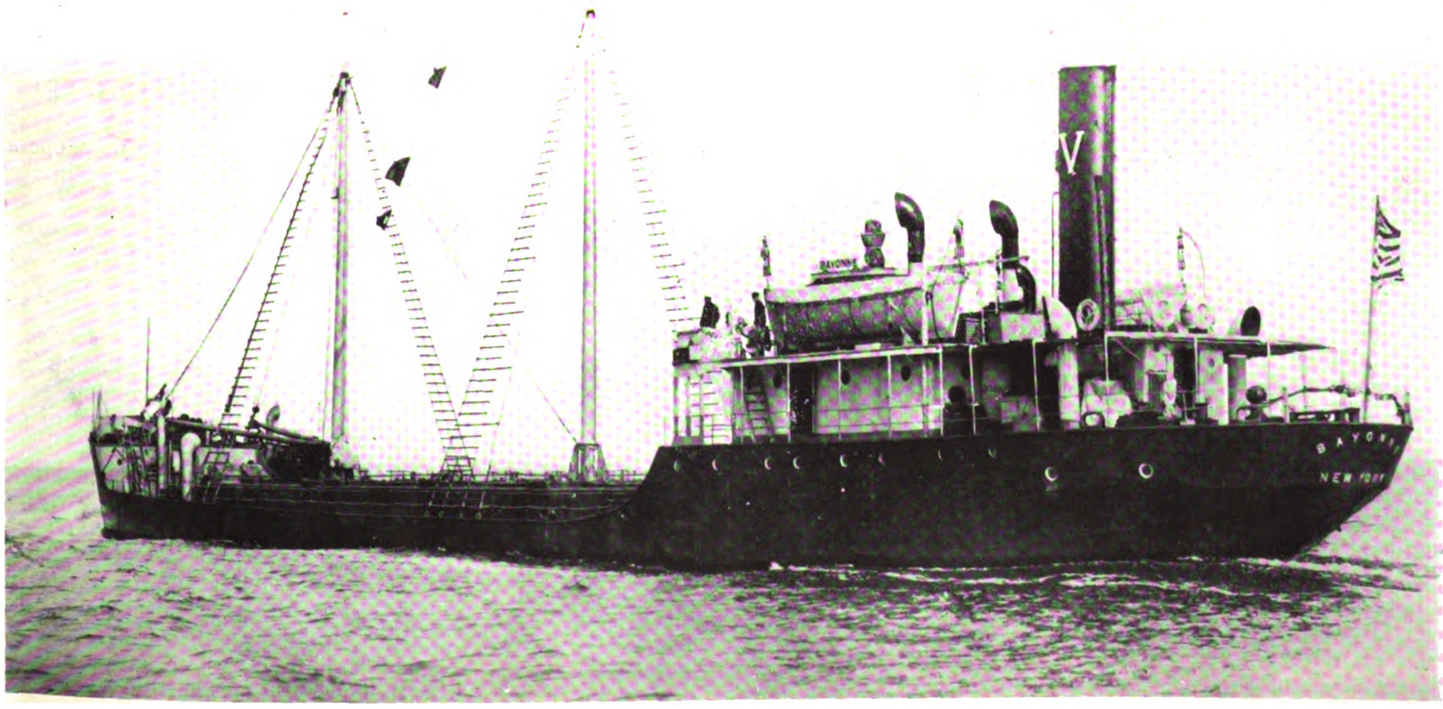


General arrangement plans of the "Bayonne"

Engine-room crew—chief engineer, 2 assistant engineers, 3 oilers, 3 firemen (for donkey-boiler), or a total of nine men.

So satisfactory has been the record of the "Bayonne," from both economic and reliability aspects, that we feel her operating data should be placed upon record; therefore we availed ourselves of the courteous privilege tendered by the owners of examining the ship's log-book. She has made, up to this writing (February, 1922), 145 round-trip voyages between the afore-mentioned harbors, always carrying full bulk-cargoes from the large refinery of the Vacuum Oil Co. at Paulsboro, N. J. (near Philadelphia) to their plant at Bayonne, N. J. (New York harbor). These cargoes consist of seven to ten different grades of valuable lubricating stock in bulk, each grade being carried in a separate tank, there being ten tank compartments, as will be noted from the accompanying plan of the "Bayonne." A special system of piping connecting these tanks is installed, peculiar to the work involved. On the trip from New York to Philadelphia she sometimes carries general cargo, but usually water-ballast. When required on trip either way she carries barrel or case-oil on deck and in the forward cargo-hold to the equivalent of about 200 barrels.

The voyage from New York to Philadelphia, or vice versa, is 215 nautical-miles, partly on the sea and partly on Delaware Bay and river or 430 miles for the round voyage. This trip is made at an average speed of 9½ knots light and 8½ knots loaded, the time re-


The American motorship "Bayonne," which has covered over 62,000 miles on 690 tons of fuel—mostly heavy boiler-oil

quired to make trips varying but a few minutes as a rule, according to the logs, and averages 22 hours, 37 min. and 25 hours, 18 min., respectively. The very slight variations occurring only occasionally in these logs bears tribute to the regularity of operation of the machinery, for the records of consumption of fuel-oil, revolutions per minute, pressures, consumption of lubricating-oil, etc., are almost identical voyage after voyage. So the vessel has covered a total of over 62,000 nautical-miles, which she accomplished on a total of 690 tons of fuel-oil. The revolutions per minute have averaged 185. The pressure of the high-pressure cylinder of the air-compressor averages 900 pounds, although as low as 825 pounds can be used. Using topped Mexican fuel-oil of 14 to 15 degrees Baumé, containing as high as 3 per cent sulphur, the fuel-consumption works out at 0.45 lb. per shaft h.p. hour. No deterioration of the valves or any part of the engines has been experienced, the valves having never been renewed, while the work in port is confined to the usual adjustments made by the engineers. This once more disputes the theory that four-cycle Diesel engines cannot use fuel with sulphuric content. This vessel has never been laid-up for any engine repairs since she went into service, and she now has over 290 one-way voyages to her credit. The daily consumption of lubricating-oil is about 2½ gallons, using Gargoyle D. T. E. heavy oil.

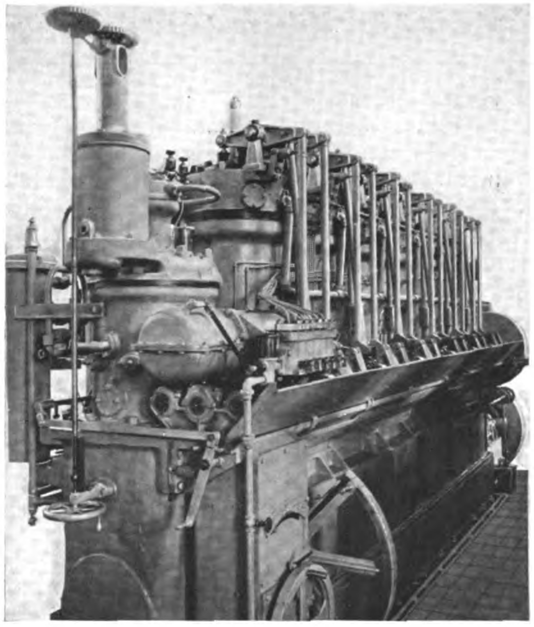
RECORD OF PERFORMANCE OF THE M. S. "BAYONNE":

Total no. of one-way voyages completed . . 290
No. of voyages loaded 145
No. of voyages in ballast 145
Total quantity of fuel-oil burned . . . . . 690 tons
Actual average speed (light & loaded) . 9 knots
Approx. total distance covered, 62,350 nautical-miles.

It should be borne in mind that in addition to low operating costs, and exceedingly low repair charges, the "Bayonne" carries about 100 tons more cargo than a steamer of similar size. Or, in other words, to do the same work and maintain the same average speed, an oil-fired steam-tanker would have to be larger overall and of higher power, and would burn at least 8 tons of fuel per day compared with not over 3 tons for both the main Diesel-engine and donkey-boiler of the "Bayonne." If a coal-burning steamer, she would burn between 10 and 12 tons of fuel daily, and would require bunkers that would occupy some of the present cargo space and thus lower her earning power.

Stress may also be laid upon the "Bayonne" being a single-screw ship, thus virtually ridiculing the assertions sometimes made that in order to obtain reliability it is necessary to make motorships twin-screw. Furthermore, she has been most economical on these short voyages, upsetting the theory that motorships are only advantageous on long trips. All the figures in this article have been checked by the Marine Department of the Vacuum Oil Co., so may be regarded as strictly accurate.

The propelling machinery is a 500 shaft h.p. four-cycle, six-cylinder trunk-piston type McIntosh & Seymour Diesel-engine, driving a Trout 3-bladed solid-bronze propeller of 8 ft. diameter, 6 ft. pitch. For tanker service steam-auxiliaries are generally required not only for smothering fire in the cargo tanks if necessary; but as in the "Bayonne," they are also used for supplying heat to the cargo steam-heating coils and for heating the fuel-oil bunkers and daily-service tanks. To generate steam a small Scotch boiler fitted with the Todd mechanical oil-burner is provided.



The 500 shaft h.p. McIntosh & Seymour Diesel Engine of the M. S. "Bayonne"

This boiler supplies steam for all engine-room and deck-auxiliaries except the auxiliary air-compressor, which is a Craig two-stage outfit driven by a three-cylinder 45 h.p. Fairbanks-Morse surface-ignition oil-engine. These steam auxiliaries comprise, on deck, a Lidgerwood double-drum steam hoisting-winch, anchor-windlass, cargo-winch and steam steering-gear. Below deck there are several steam-auxiliaries, such as cooling-water circulating-pump, bilge, fire, sanitary-pumps, electric generating-set, and in the pump-room are three National Transit Pump & Machine Co. cargo-pumps, each of a capacity of 410 barrels per hour, and a Dean duplex-vertical pump. The hull of the vessel was built at Newburgh, N. Y., to the Isherwood longitudinal system from designs by Kindlund & Drake of New York, who in conjunction with the Marine Department of the owners, planned the installation layout.

In order to maintain proper temperature of the fuel between the daily-service tanks and the engine, there is a special hot-water heating installation, this being arranged as follows: Each daily service tank is heated by a steam-coil; the fuel-oil bunkers are also heated by steam. The fuel-oil leads from the daily-service tanks to a Richardson-Phenix oil-heater, which is surrounded by a steam-jacket. From this heater the oil-piping leads to the manifold on the engine and to the atomizers at each cylinder. A hot-water boiler-tank containing steam-coils is located in the engine-room, and from this tank hot-water piping leads to the point where the fuel-oil piping comes from the daily-service tanks, and the hot-water pipe follows the oil-piping to the heater, thence to the atomizers on the engine.

The "Bayonne"—although a little vessel—is a credit to the American merchant-marine and to the ability of American Diesel-engine manufacturers, proving that we can build motorships and machinery second to none in efficiency, reliability and economy. She has done the work laid down for her, and has done it well. Credit of the proper share of the splendid record of this vessel is due to careful operation by the owners in coordination with the loyalty of her officers and crew.

Wooden Ships That Pay

Success During Depressed Times with Diesel-driven Craft, Contrasting with Unparalleled Failure of Wooden Steamers in Days of High Freight-rates and Plentiful Cargoes

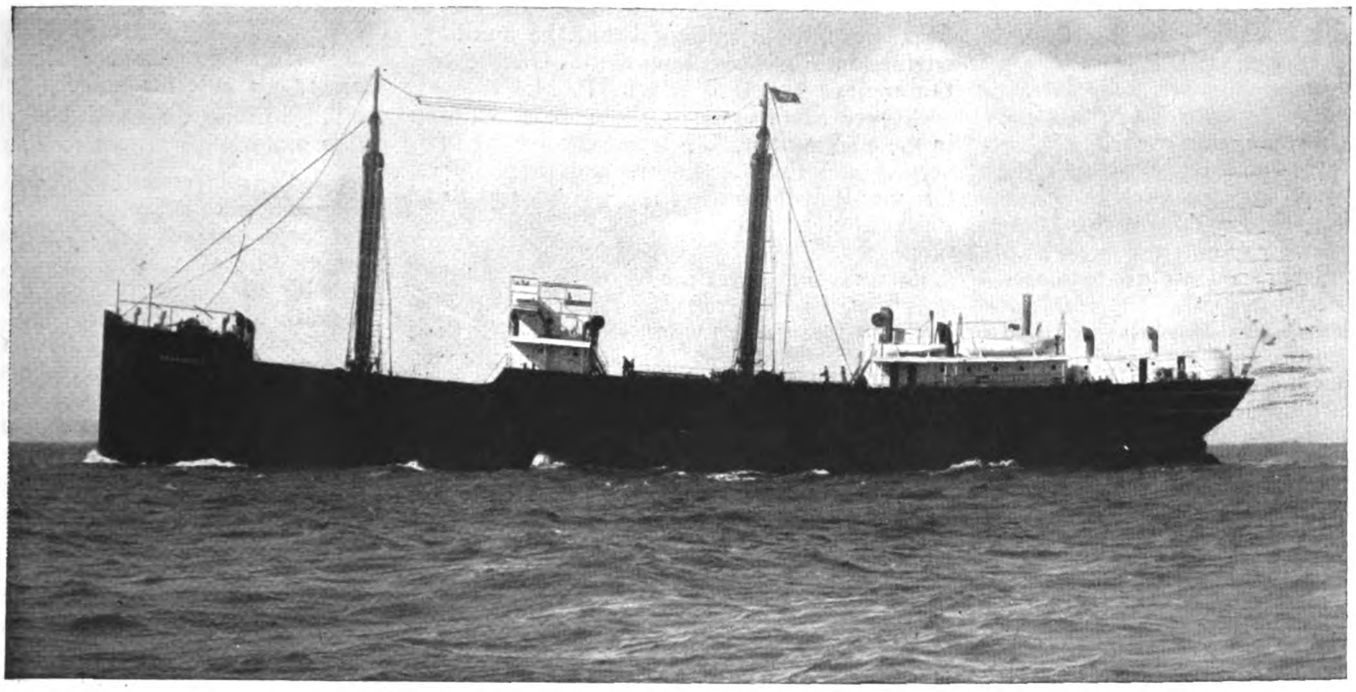
WITH so many modern steel steamships laid-up during this extended period of ocean-freight depression, and with so many hundreds of wooden-steamers not worth the lumber they are built of, it may astonish some shipowners to learn that there are a number of full-powered Diesel-driven seagoing motorships in successful service to-day, running in competition with steel steamships—this in the face of the absolute failure of hundreds of steam-driven wooden ships built at the same time, and yet which did not pay to operate under conditions of moderately freight-rates and fairly plentiful cargoes. By the latter we mean the period when the peak of good shipping conditions had passed and freights had commenced to tumble, but when they had not reached to-day's low level and scarcity. One very successful wooden motorship on the Atlantic Coast is I. T. Williams Co.'s Winton engined "James Timpson," which has such an economy that they have considered themselves justified in keeping her in operation until now. Unfortunately she recently struck a hidden reef, damaging the hull and straining the machinery, but she successfully made port and is now being repaired. The accident, which may have caused the loss of some steel vessels, speaks well for the construction of her hull and oil-engines.

Loading the wooden motorship "Babinda" with paper

Another very practical and economically successful wooden motorship is Libby McNeil & Libby's Dow-Diesel engined twin-screw freighter "Libby Maine," now operating on the Pacific Coast, whose splendid record has been published in MOTORSHIP.

The Ocean Motorship Company of San Francisco, Mr. W. E. Guber, Jr., President, has recently placed the three large "B" class wooden motorships, "Benowa," "Babinda" and "Boobyalla" in a new service between Portland, San Francisco, Oakland, San Pedro and San Diego. This firm has secured the contract for carrying 6,000 tons of paper per month for the Crown Willamette Paper Company from the Columbia River Mills to San Francisco and San Pedro.

General cargo will be handled on the Northern and return trips. Cement, sugar and cotton will form a part of the cargo from San Pedro to Portland. Southbound, in addition to paper, sufficient general merchandise will be transported to complete cargoes. Heretofore the paper contract has been held by the Pacific Steamship Company which operates a fleet of steamers. Paper from the Vancouver



The successful wooden motorship "Boobyalla," owned by the Ocean Motorship Co., and powered with two 500 shaft h.p. McIntosh & Seymour Diesel Engines

Mills is now being brought to San Francisco by the fleet of Canadian government steamers.

The Ocean Motorship Company—it may be remembered—recently bought all rights of the Pacific Motorship Company of which Mr. R. J. Ringwood was president, but who is now with the U. S. Shipping Board. The company has agents at all the ports of call. They are represented by the Columbia Pacific Ship Company in Portland; W. L. Comyn & Co., Inc., 310 California street, San Francisco; McCormick, McPherson and Lapham in Los Angeles and San Pedro; and H. W. Deas in San Diego. Before long they will have a wharf assigned to them at San Francisco.

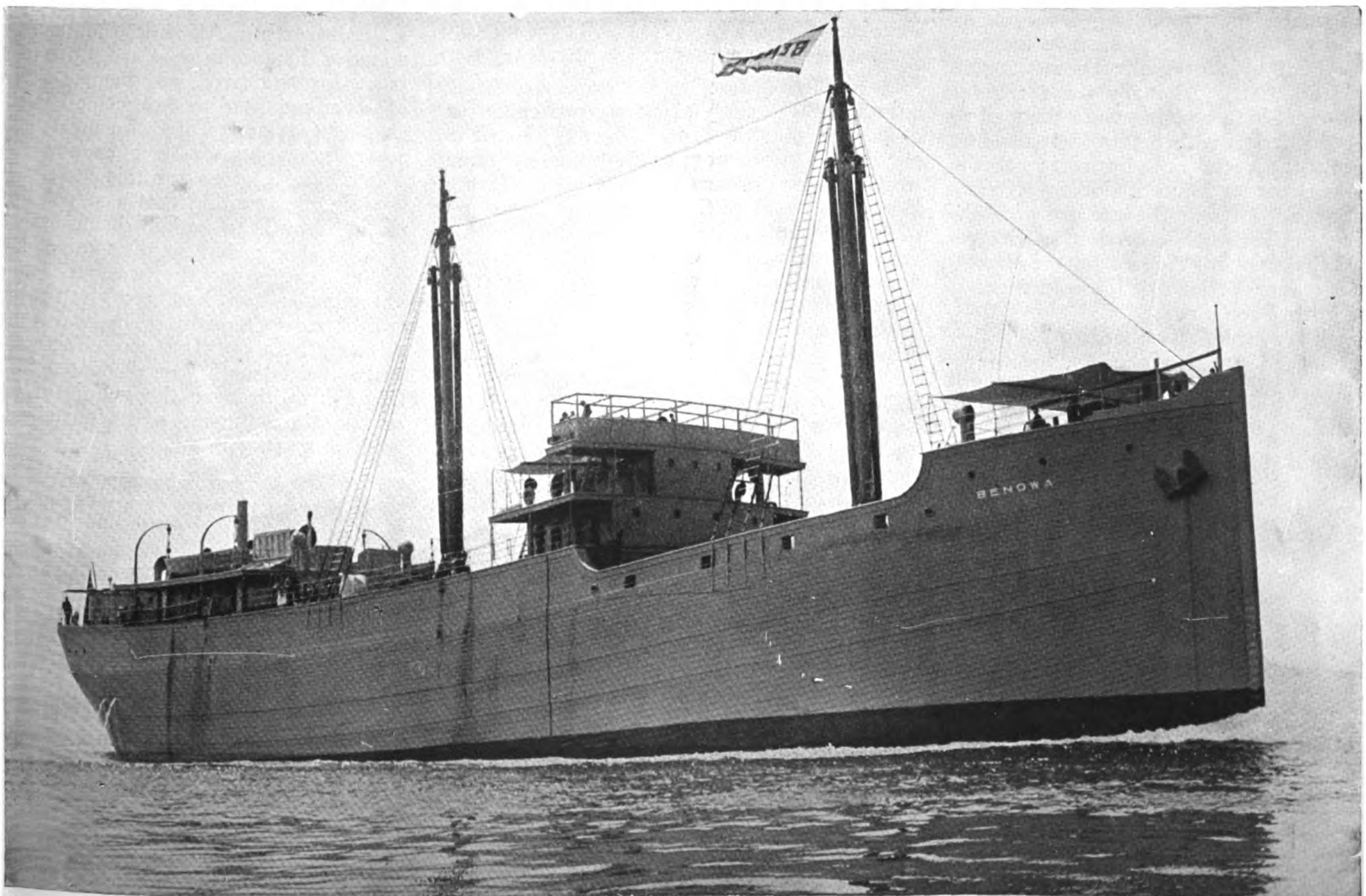
At this writing, January 25, the "Boobyalla" is loading at San Francisco, for Portland, the "Babinda" has just left San Francisco for San Pedro (this being her first trip South from Portland) and the "Benowa" is being overhauled at the Bethlehem Shipyard.

When all three motorships are placed in operation there will be a sailing from Portland every eight days, giving the best service on the Pacific Coast. The "Babinda" is in charge of Captain F. A. Vega who has been with the company for four months. The chief-engineer, W. P. Bissner, and the first-engineer, Fred Jackson, have been with the "Babinda" for the past eighteen months, and have nothing but praise for Diesel drive.

Before being laid-up on the "mud flats" at Sausalito while the snarl of red-tape was being untangled the "Babinda" was engaged in tramp service around the world and between Seattle, Vancouver, Seattle and South American ports carrying general cargo.

On the last voyage she carried case and barrel gasoline from Talara Peru to Central American ports. She took cow horns from the Central American ports to San Francisco. Her last voyage ended March 1, 1921. She was laid-up at Sausalito from March 1, until January 10, 1922, when she started for Portland (light), where she loaded paper and general cargo for the trip to San Francisco, Oakland, San Pedro and San Diego.

During the past four months Chief-Engineer Bissner has spent his time in overhauling



The wooden motorship "Benowa," still in profitable service, having secured a paper-carrying contract away from a concern operating only comparatively-uneconomical steamers

and adjusting the machinery of this fleet of motorships.

Each of these motorships are equipped with two 640 indicated horsepower (500 shaft h.p.) McIntosh & Seymour four-cycle Diesel-engines. They are wooden vessels built during the world war, and are interesting commercially because, being equipped with Diesel-engines, the economies in operation—as stated—have enabled these wooden craft to successfully compete with steel steamships at rates under which no wooden steamship would have been able to operate. In fact, they have been able to make paying voyages at rates which kept steel steamships tied-up. This operating economy is due to the low fuel-consumption of the engine and the small crew required, together with the fact that on account of the small amount of fuel required, more cargo can be carried.

For the average of a large number of voyages the daily fuel consumption of these ships was four-and-three-quarters (4¾) tons at an average speed of about nine knots, with an average cargo of about 3,800 tons.

On the recent voyage from Portland to San Francisco the "Babinda" used 3,778 gallons of 19 degrees Baumé fuel-oil and 35.8 gallons of lubricating oil, and averaged 9.6 knots. The 3,778 gallons included both the main and auxiliary engines. The running time of the voyage from Portland to San Francisco was 72 hours and 20 minutes. The main engines used 6 gallons of lubricating-oil and the auxiliary engines used 6 ½ gallons daily. On the trip the engines averaged 183 R. P. M.

A very small crew of six men is required in the engine-room. The crew consists of first, second and third engineers and three oilers. On the deck there are first, second and third officers, eight sailors, steward, cook, mess-boy.

On arrival at San Francisco, the "Babinda" was visited by the officials of the Ocean Motorship Company, who were more than pleased with the excellent condition of the vessel and cargo. The stevedores were all happy, because of the cleanliness of the vessel and cargo, and the excellent stowing of the latter.

The electric cargo handling equipment worked perfectly, and an excellent record was made in unloading.

The "Babinda" has a fuel carrying-capacity of 98,309 gallons giving a steaming radius of 98 days. Fuels of 15, 19 and 24 degrees Baume have been used on this motorship, but according to Chief-Engineer Bissner the best results are obtained with 19 degrees oil. On account of excellent stowage, reliable operation of the electric-winches, the claims we are told will not exceed $10 for the whole cargo of 4,300 tons measurement (deadweight 2,500 tons). Future outlook is excessively pleasing, Southbound particularly the vessels are engaged full with the paper contract and food stuffs for many months to come. Mr. R. H. K. Smith (formerly of Royal Mail Steamship Co. and general manager of Gulf Mail), is traffic manager.

The leading dimensions of the "Benowa" class motorships are as follows:

Loaded displacement	6,883 tons
Deadweight capacity	4,441 tons
Net-cargo capacity	206,888 cub. ft.
Length OA	282′ 6″
Breadth BP	278′ 9″
Breadth MD	46′ 10″
Horsepower	1,000 shaft h.p.
Propellers	8′ dia by 6′ 4″ pitch
Propeller speed	175 r.p.m.
Loaded speed of ship	9½ to 10 knots

It is interesting to note that sister wooden steamers, built at the same yard at the same time, had 46,740 cubic-feet less cargo space, had to carry 533 tons more fuel, and the steam-plant weighed 58 tons more than the Diesel-machinery. Needless to say, the steamers have long since been out of business. Yet the extraordinary fact exists that there are still some American shipowners who cannot yet see the economy of motor power, or who have insufficient faith in the reliability of the Diesel-engine to change to this power. Some of those shipowners have been driven-out of business, as for instance, the Brooks Steamship Company, who could not profitably operate a fleet of wooden steamers, a situation that other shipowners also encountered.

Another Profitable Wooden Motorship

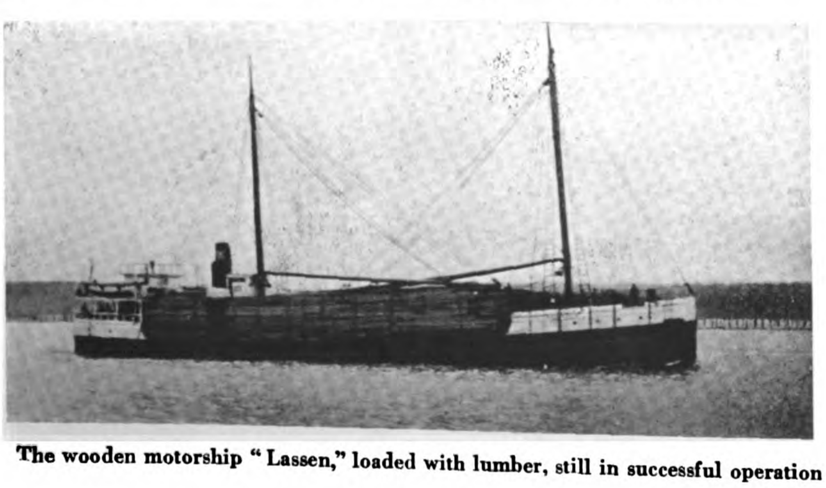
The San Francisco Ship "Lassen," Powered With Twin Pacific Diesel Co.'s Surface-Ignition Oil-Engines

REGULARLY running over the 935 nautical-miles between Puget Sound, Wash., and San Pedro, Cal., making excellent trips for several years, is the wooden motorship "Lassen" owned by a lumber concern at San Francisco, Cal. This vessel was built about 1917 at the Matthews shipyard, Hoquiam, and is of 700 tons gross. She is propelled by twin 350 b.h.p. surface ignition oil-engine built by the Pacific Diesel Engine Co., Oakland, Cal. Originally these engines were of the hot-bulb type but were changed to the hot-head design with better fuel economy results, and the vessel now burns 23 barrels, *i.e.*, 3½ tons per 24 hours including all auxiliaries at sea. One of the auxiliary oil-engines runs the entire time driving an electric generator for supplying current for the electric heaters, necessary because of the cold weather off the North Pacific coast.

Although very rough weather is often met—says Frank A. Horn, her chief-engineer—we have been making fine trips, the engines handling excellently due to good governors. The round voyage of 1,870 miles is covered in 21 days including loading and discharging, although considerable time is taken to stow the cargo in a manner affording protection from the heavy seas. Her average speed is 7½ knots loaded and 8 knots in ballast. Her dimensions are as follows:

Cargo capacity (lumber)	749,000 cub. ft.
Length	180 ft.
Breadth	40 ft.
Draft	7½ ft. forward, 16 ft. aft.
Power	700 shaft h.p.
Fuel-capacity	62 tons
Daily fuel-consumption	3 1-3 tons

A wooden steamer of the same size would only be able to carry about 550,000 cubic-feet of lumber, and would burn over 8 tons of oil per day. On one voyage the "Lassen" went to Guaymas, Mexico, from Gray's Harbor, Wash., and back to San Francisco—a distance of 3,560 nautical-miles—in 28 days with a cargo both ways. One engine ran continuously and the other was only stopped for five minutes to change a fuel nozzle. Her present engineer has been chief of this vessel since December 24, 1918, and has found the engines to be "on the job at all times," as he expresses it. Often she has to pass over very rough bars. For engine-room auxiliaries there is a 13 b.h.p. oil-engine and one of 9 b.h.p., but the cargo is handled by steam-winches fed from a small horizontal donkey-boiler, which is only used when in port.



The wooden motorship "Lassen," loaded with lumber, still in successful operation

GOLDEN GATE FERRY TO HAVE PACIFIC-WERKSPOOR DIESEL-ELECTRIC DRIVE

To Be Followed by New Sister Motorship

FIRST intimation that the Golden Gate Ferry Company of San Francisco, Cal., were to construct a large motor-ferry was given in our special Pacific Coast Number in August last. This intention has now become a concrete proposition, the hull being under construction at the yard of James and R. J. Robertson, Alameda, Cal., and will have a loaded displacement of about 910 tons. Contract for the two twin main Diesel-engines has been awarded to the Pacific Diesel Engine Co., of Oakland, Cal., who are building two six-cylinder 525 brake horse-power Werkspoor Diesel-engines for this vessel. It is interesting to mention that a second and sister motor-ferry is to be laid down, probably this month. The order for the two 365 k.w. electric-generators and the two 750 b.h.p. electric propelling-motors has been given to the General Electric Company. The total cost of each ship will be about $350,000. The new ferries will have a length overall of 220 ft., an extreme breadth over the guards of 64 ft., a beam at the water-line of 40 ft., and a depth of hold of 17 ft. 3 in.

NEW DIESEL-DRIVEN SUBMARINE MOTHER-SHIP

On December 31 the naval motor-vessel "Pelikaan" was launched by the Netherlands Shipbuilding Co., of Amsterdam, to the order of the Colonial Department of the Netherlands Government. She has the following demensions:

Displacement	2,300 tons
Power	1,400 shaft h.p.
Speed	12 knots
Length	305′ 6″
Breadth	43′ 0″
Depth	27′ 0″

The "Pelikaan" is a submarine mother-ship, and is being fitted with twin Schelde Diesel-engines of 700 shaft h.p. each, constructed by the Konink. Maats. de Schelde, of Flushing, Holland.

Construction of Diesel Engines at U. S. Navy Yard

First of 1,000 B.H.P. Submarine Diesel Engines Tested

ANOTHER example of the excellence of American marine Diesel-engine construction is to be found in the first engine for submarines S10 to S13 that recently ran tests at the New York Navy Yard, Brooklyn, N. Y., where it was built from plans based on one of the submarine propelling-sets purchased from the British Admiralty by the Navy department. This engine we were privileged to see prior to dissembling, and an illustrated description will appear in MOTORSHIP when the erection of the second engine is completed, no photographs of the first one having been made, it having been dismantled immediately the trials were finished. Altogether eight of these 1,000 b.h.p. Diesels are being built.

So satisfactory was this first engine on the block that the naval engineers responsible for the difficult task of its manufacture—we say difficult because of the delicate nature of some of the steel castings—are more than pleased with the result. Also, it must be remembered that they have had no assistance from the designers of the original engine, but it was necessary to investigate the model engine part for part, sawing in two important castings in order to ascertain the thickness and strength of the metals.

Generally speaking, the workmanship and material of the Brooklyn engine are better than those of the original engine; but it must be remembered that the imported model was one of those built in big quantities in rapid time towards the end of the war, when Germany had great trouble in securing proper materials, and when most of the machine-tools of her engineering plants were probably worn-out, as well as the energies of their mechanics. On the other hand many of the machine tools at the Navy Yard are far from being properly adapted for Diesel-engine quantity construction and do not compare with the equipment at many American civil Diesel-engine building works. However, everything has been properly jigged at the Navy yard, all making for accuracy and quantity production. The navy's engineers have made a very fine job.

The engine is of the four-cycle, trunk-piston class in six cylinders 17¾ inch bore by a fraction over 17½ inch piston-stroke. It developed 1,200 shaft h.p. at 450 r.p.m. but is rated at 1,000 b.h.p. at 427 r.p.m. and weighs about 30 tons, or 50 lbs. per b.h.p. We do not propose to publish the test records of this engine, as the brake used was of an old electric model, and the results recorded may not be strictly accurate. The second engine however, will have her load tested by means of a new Froude dynamometer just received, which is capable of taking-up to 4,000 horsepower. So the trial report of the second engine will be included in our forthcoming description. Tests were made on the Standard Oil Co.'s regular Diesel oil. The first set was built under the supervision of Commander W. H. Pashley, who has just left this department for the destroyer squadron, in accordance with the regular schedule of the Bureau of Navigation of three years on land and three years on the sea for all officers. Consequently the completion of the remaining motors will be in the charge of Commander J. R. Mann.

Also at the Navy Yard is a pair of the 3,000 b.h.p. Augsburg 10-cylinder Diesel engines, and one of these has been run a series of trials, some of which were purposely severe to an excess in an attempt to cause the engine to wreck itself; but without success, so well is it designed and built. Both sizes of engines run with remarkable smoothness of freedom from vibration except, of course, at their critical speeds.

If an appropriation can be obtained from Congress, the pair of these 3,000 b.h.p. Diesels may be installed in a surface craft. In fact, to our mind a valuable type of submarine-destroyer could thus be evolved, as we frequently advocated in vain during the War.

First German Motorship With Burmeister & Wain Engines

Diesel-Driven Tanker "JULIUS SCHINDLER" Nearing Completion at the Deutsche Werft, Hamburg

TRIALS are awaited with interest in Germany of the first motorship to have Burmeister & Wain type engines, especially as her machinery was actually constructed in that country under license. This is the single-screw 3,700 tons deadweight tanker "Julius Schindler," built to the order of the Julius Schindler Oelwerke Company, oil-importers, Hamburg, at the Deutsche Werft, Finkenwarder, Hamburg, and fitted with a Diesel-engine built by the associated firm of the A. E. G. (General Electric Co.) at their turbine plant in Berlin. Only one other Burmeister & Wain Diesel-engined vessel has ever been owned by Germans, namely, the East Asiatic Company's original "Christian X," which was purchased inspection by the ex-Kaiser and the late Herr Ballin shortly after the ship had run her trials. During the war the Italians took over the "Christian X" and re-named her "Fratelli Bandiera." We believe that the French Government later acquired her, and probably have changed her name again, as we have not heard of her for many months. The East Asiatic Company promptly built another motorship.

Obviously some German shipowners are conversant with importance of building Diesel-ships to enter into world-wide competition on the high seas, and in the case of the "Julius Schindler" she was constructed without the owners availing themselves of financial assistance from the German Government.

It is interesting to record that the normal-stroke type 1,550 I.H.P. Diesel engine turning at 125 R.P.M. has been adopted for this single-screw ship as well as for a sister craft now building, instead of adopting the new long-stroke slow-speed design of Diesel-engine especially developed by Burmeister & Wain for single-screw vessels. This decision we understand was made after extensive propeller-model tests at the Hamburg Tug Laboratory.

The actual holder of the Burmeister & Wain license, as before announced in MOTORSHIP, is the Deutsche Oelmaschinen Gesellschaft (German Oil-Engine Company) which also has rights in Italy, although not exclusively in the latter country. The D.O.G. was formed by the A.E.G., the Hamburg-America Line, and the big ore concern, the Gutehoffnungshutte. These companies also control the Deutsche Werft shipyard, which should not be confused with the Deutsche Werke shipbuilding plant at Kiel.

The main dimensions of the "Julius Schindler" are as follows:

Class and Society,
Germ. Lloyd=$\frac{100}{4}$ A (E) Tankdampfer

Length (O. A.)	327′ 6″
Length (B. P.)	308′ 4⅞″
Breadth (Moulded)	45′ 3 5/10″
Depth (Moulded)	23′ 11 7/10″
Loaded Draught (Mean)	19′ 10″
Displacement (Loaded)	6,200 tons
Dead-weight-capacity	3,700 tons
Cubic-capacity of Holds	156,160 cub. ft.
Cubic-capacity of Deep-Tank (Cargo)	5,960 cub. ft.
Capacity of Fuel-bunkers:	
Double-bottom	90 cu. m.
Wingtanks	140 cu. m.
Total Fresh-water Carried (tons)	46 cu. m.
Shaft Horse-power	1,260 H.P.
Indicated Horse-power	1,550 H.P.
Engine Speed	125 R.P.M.
Ship's Speed (Loaded)	9½ to 10 knots
Daily Fuel-Consumption	5.3 tons
Type of Diesel-Engines	Burmeister & Wain
Cylinder Bore	630 mm. (24.803″)
Piston Stroke	960 mm. (37.795″)
Weight of Main Engines (with thrust-block, but without propeller and shafting)	185,000 kg.
Weight of complete engine-room machinery, including propeller, shafting, cargo-pumps and deck-machinery	406,000 kg.
Length of Machinery Space	19.8 meters (65½ ft.)

Part of the auxiliary machinery is steam driven and part is Diesel-electric. For the first mentioned a donkey-boiler having 110 square meters heating-surface is installed, which can be fired with oil or coal. The total capacity of the six twin cargo-tanks is 3,400 tons.

KRUPPS SELL FIVE MOTOR SCHOONERS

Five new motor-schooners of 620 to 640 tons deadweight have been purchased from the Fried Krupp A/G Germaniawerft of Kiel-Gaarden, Germany, by Donitz, Witt & Co., shipowners, Hamburg. The vessels are named "Annen," "Buckau," "Dattebu," "Gaarden" and "Hamm" and each is fitted with a M.A.N. four-cycle Diesel oil-engine of 160 shaft hp.

ANOTHER DANISH MOTOR FERRY

Now under construction at the Naskov shipyard is a recently ordered motor ferry-vessel for the Mommark Ferry Co., a new concern lately formed by the East Asiatic Co., the South Jutland Co. and the South Fyn Railways with a capital of Kr. 1,500,000. This vessel is of about 300 tons and will carry 400 passengers and 20 automobiles at 11½ knots between Mommark and Faaborg, the trip taking about 1 hr. 20 min. For propelling-power twin 350 shaft hp. Holeby four-cycle type Diesel-engines will be installed. They will be non-reversing, as reversible propellers will be adopted.

ENGINES OF CONCRETE MOTORSHIP

The Sulzer Diesel-engines of the concrete motorship "Gotaelf," the hull of which has been condemned, will be installed in a new iron hull by the same owners.

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MOTORSHIP

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BOILER-OIL AS FUEL

On another page in this issue trial reports are given of a big British Diesel-engine which is about to be manufactured under license in the United States by a prominent firm of shipbuilders on the East Coast. These trials are of particular interest because of the use of a British-standard boiler-oil, and because the American engine doubtless will have to operate on the U. S. standard of boiler-fuel. It will be noted from the specifications of the oil that the British method of making an analysis of oil is somewhat different to the American practice. For instance, the Redwood system of viscosity test is many years old and was originally intended for light oils, which was quite satisfactory for those grades. With the advent of the use of heavy Mexican oils for motorships this method is not always accurate. Also the density of oil is quoted in a specific-gravity scale, whereas the practice in vogue in this country is to quote oil as being of so many degrees Baumé. The oil used on the test of the British engine figures out at 18.5 degrees Baumé. While this is a heavy oil, it is by no means as heavy as is now being used by a number of American motorships, nor is it quite as heavy as practically all motorships will have to use in the near future. Some American motorships are successfully using oil of 14.5 degrees Baumé, whereas fuel-oil of 18½ degrees Baumé will only partly meet the coming situation, it having a slight content of light-oil.

In our December issue on page 978 we clearly outlined the importance of designing installations of Diesel-engines to use the heaviest grades of Mexican and other fuel-oils, with the exception of Panuco crude, which latter we believe the insurance underwriters will not allow to be used as fuel on steamers or motorships, because of the presence of a varying percentage of gasoline. As to exactly how far these conditions will apply to British or American motorships obtaining oil in other countries we cannot say, as the attitude of the Royal Dutch-Shell Combine and its subsidiaries has not been announced regarding the maintenance of a world-wide supply of Diesel-oil at low cost. But, it will apply to British motorships that secure their fuel from the depots of the leading American oil-companies; because as previously indicated, the cost of Diesel-oil is to be made higher and this fuel eventually drawn from the marine market.

TWIN OR SINGLE-SCREW MOTORSHIPS

In an editorial discussion of Diesel-engine progress, the "Marine Engineer & Naval Architect" in a recent issue stated that—"it does not redound entirely to the credit of the Diesel-engine that in a majority of instances in which it has been applied for ship-propulsion it has been considered advisable to install twin Diesel-engines, which is done largely with the idea of enabling a ship to keep under way even when one of the engines is temporarily out of commission. Until Diesel-engine designers are sufficiently confident to advocate the single-engined motorship it is unlikely that this form of propulsion will make a very rapid advance."

It is necessary for us to take exception to this mis-construction placed upon the use of twin-screws in motorships. It is not the Diesel-engine builder that usually advocates twin-screws, but it is the desire of shipowners, who—because of their inexperience with Diesel-drive—are somewhat nervous and feel happier over their investment if it is split into two units. As a matter of fact, in the case of a new ship, there are many advantages to be gained by the use of twin-screws, which probably more than offset the disadvantages. In the first place it has been proven by tests and regular service that better propeller-efficiency can be obtained with two propellers than with one large propeller. They are of smaller diameter and are sub-merged deeper where they receive more solid water and without interference from hull structure; also, being lower in the water and of smaller diameter they do not rise out of the water so often. Furthermore, being more deeply immersed, they are more efficient when the vessel is proceeding in ballast, with the result that the ship obtains a better speed with the vessel light. This is important economically because she is making a voyage with practically no money-earning cargo, so the shorter the period at sea, the better. When a single-screw ship is in ballast half of the propeller generally is out of the water with resultant loss of efficiency. Under existing freight conditions this is a big item.

Then again, by adopting twin-screw installations the engine-room can be made about ten feet shorter, allowing more bulk cargo to be carried. Finally it should not be overlooked that lost propeller-blades (or the entire propeller itself) is one of the most frequent accidents that occur at sea, so that an additional safety-factor is given to the twin-screw whether steam or Diesel propelled. Propeller accidents of steamships are proportionately far more frequent than break-downs with the Diesel-engines of a modern motorship, an important consideration usually not taken into proper valuation. Rudder accidents too are common and a twin-screw ship can steer to port with her rudder disabled—another safety factor.

Yet, in the face of these factors, there always will be quite a market for the large slow-speed Diesel-engine suitable for single-screw, also for the Diesel-electric drive with multiple power units and single propeller, partly because there are likely to be more conversions from steam to Diesel than new ships built during the next few years, and most of the existing steamships are single-screw boats. Consequently, the cheapest method of conversion will be to retain the existing propeller-and-shafting and adapt Diesel machinery accordingly. But, any shipowner figuring upon increasing his fleet, should give very serious thought to twin-screws, not from doubt of reliability of the Diesel-engine, but from the question of both all-round reliability and efficiency of the entire propelling-plant. Much, of course, depends upon the class of ship and the service in which she will operate.

THE "MOD" NOT A MOTORSHIP

Some of the recent reports regarding the sinking of the Norwegian ship "Mod" referred to her as a motorship, a misunderstanding evidently having arisen through the vessel being propelled by oil-fired boilers and turbine-electric drive. She was a new ship. On the return journey of her maiden voyage, loaded with grain, she lost a propeller, and being powerless, was sunk by the heavy seas. The captain and ten of her crew lost their lives.

LLOYD'S SAY NUMBER MOTORSHIPS DOUBLED IN ONE YEAR

Too much significance cannot be placed upon Lloyd's recently issued review of the world's merchant-ship construction during 1921. The following is a very interesting paragraph that we have culled from this report:

GAIN IN MOTORSHIPS

> Motorship construction continues to gain. Vessels to be fitted with internal combustion engines which were launched last year total 306,642 gross tons, as against 189,977 tons in 1920. A decline is indicated, however, in the construction of ships fitted with turbines, the aggregate of this class of ships for 1921 being 1,195,000 tons, compared with 1,825,000 tons the previous year.

The foregoing supports our contention that the geared-turbine is practically dead in as far as new cargo shipbuilding is concerned, and that this type of comparative uneconomical propelling-machinery is surely being supplemented by more efficient Diesel-power.

PROGRESS OF MARINE ENGINEERING

Certain events in history have appealed more forcibly than others to mankind in general—have touched the imagination and compelled admiration and emulation, leading ever to heroic effort and thus to progress. The sea, the great divider of the human race, has become the means of union, the medium of intercourse, without which man must have remained primitive and helpless. So every achievement on the ocean has a peculiar value, leading higher in the evolution of man. Shipbuilding has gained many triumphs, each marking a stage forward from the wooden barques of early days to the large steel clippers of the nineteenth century; from the modest early Victorian steamships to the modern leviathans. In propelling machinery, from the single and compound engines to triple and quadruple expansion, then turbines of various designs, followed by the introduction of oil-fuel to the boilers—all expressive of human ingenuity in seeking the most efficient and economical type, until we come now to what amounts to a practical revolution in marine engineering—the first passenger motor-vessel—the "Aba." A ship carrying passengers without the aid of boilers —a great step forward in maritime development.—*Liverpool Journal of Commerce.*

Impressions of the Diesel-Electric Ship "Fordonian"

Possibilities of This System of Propulsion —Developments That May Be Made With Advantage, Based Upon Observation of the Installation in the First American Vessel of This Type

By COMMANDER C. A. JONES
Bureau of Engineering, U. S. Navy Dept., Wash., D. C.

AS stated in the preliminary discussion—the February issue of MOTORSHIP on January 13, 1922, the single-screw cargo-vessel "Fordonian," 4,400 ton dw. completed a very successful trial-trip for the initial test of the Diesel-electric machinery recently installed. This being the first installation of Diesel-electric propelling machinery on a vessel of this type, it offers many interesting points for discussion. First we will give a brief repetition of the description of her machinery installation, together with some additional descriptive matter.

Diesel Engines

There are two Diesel-engines designed and built by Ansaldo-San Giorgio of Turin and Spezia. They are each of the four-cylinder, 2-cycle, single-acting, crosshead type, and develop 500 brake horse-power at 200 R.P.M. The engines were built in Italy, dismantled, and shipped to the United States where they were assembled and installed in the ship by Todd Shipyards Corp., New York. The illustrations show cross sections of a three-cylinder Ansaldo engine, which although not of the same power as that installed on the "Fordonian" is of similar construction. Cast-iron side frames are bolted to the bed-plate and carry the cylinders. These frames give a totally enclosed construction and are provided with large inspection doors. The main force exerted by the combustion of the oil is taken by long forged-steel columns which tie the cylinders to the bed-plate. The cylinders have internal liners, which are removable and free to expand downwards.

A vertical shaft on the generator end of the engine, driven from the crank-shaft, drives the camshaft controlling the distribution gear. This vertical shaft also drives the constant-speed regulating governor. The camshaft is carried along the front of the engine near the top of the cylinders and operates the starting-valves and atomising valves. There are no exhaust-valves, port scavenging being employed. The scavenging-air enters each cylinder through a port in the cylinder walls, being admitted by an automatic valve which opens as soon as the scavenging-air pressure is equal to or slightly above the pressure within the cylinder.

Simplicity of this scavenging-port simplifies the manufacturing process and the absence of exhaust and scavenging valves in the cylinder-head also makes the latter casting comparatively simple. The only openings in the cylinder-head are thus the air-starting valve, atomiser-valve, and safety-vale. The use of this type of scavenging-valve allows a much lower scavenging-air pressure, which is of considerable advantage. The air pressure carried during the trial was only from 3 to 3½ pounds. The engine could have been still further simplified by the use of electric starting.

The pistons are of the piston-rod and crosshead type and are oil cooled—not fresh water cooled as previously quoted—the oil being supplied through telescopic-pipes. After cooling the piston the oil is circulated through a cooler to lower its temperature.

The scavenging-air is supplied by a compressor driven from the crank-shaft and supplied to the receiver carried along the front of the engine. The main air-compressor is of the three-stage type and driven direct from the crankshaft. The fuel-pump is controlled by the camshaft, and is provided with one cylinder for each main-engine cylinder. The amount of fuel delivered by the pump is regulated by the governor which controls the length of time the suction-valve is kept open, during the delivery stroke. The governor also regulates the atomising-air at the same time by varying the suction-intake area of the air-compressor. The engine has direct-connected pumps for supplying circulating-water, piston-cooling oil and forced lubrication.

From an inspection of the engine, one is impressed with the arrangements made for easy access for repairs and examinations. The governor did not operate properly during trial, but from data available on other engines of this type fitted with this governor this was probably due to the need of proper adjustment. In reports of test of a similar Ansaldo engine of 300 H.P. the variation in speed in passing from full to no load was only about 2 per cent.

The Electric Equipment

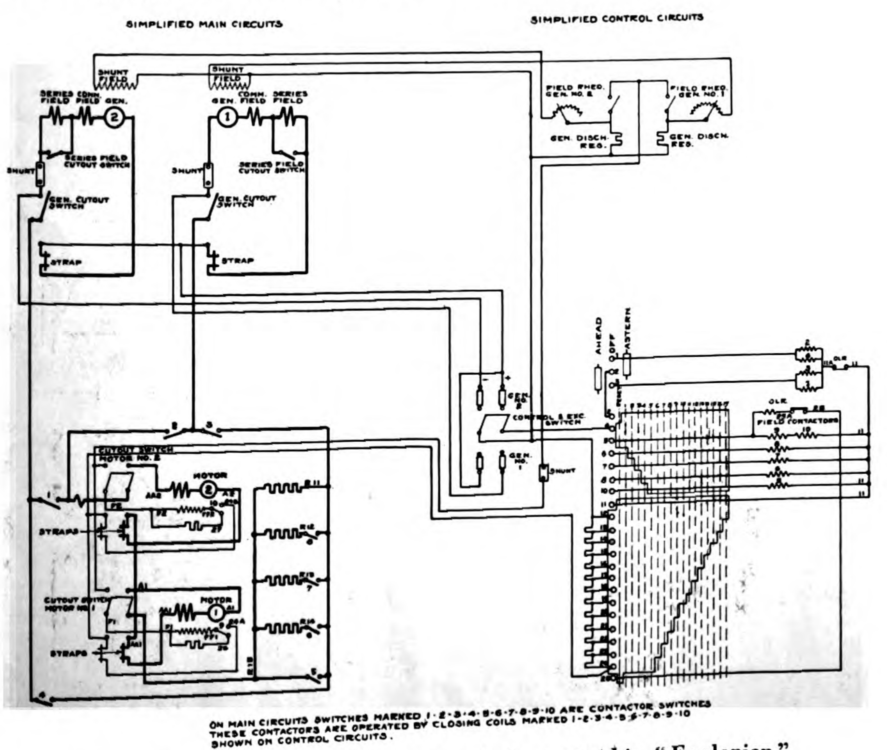
The electric-propulsion equipment consists generally of two main generators, two main motors, and the necessary control-panels with switches, contactors and connections. This equipment was manufactured by the General Electric Company. Each main generator is rated by 350 K. W. at 200 R.P.M. 250 volts and compound wound. The generator is direct connected to a Diesel-engine by a flanged coupling.

Each motor is rated at 425 H.P. at 120 R.P.M., 250 volts and is shunt wound with commutating poles. The two propelling motor armatures are mounted on the same shaft which is direct-connected to the propeller shaft. The motors are ventilated by a 7½ H.P. electric-driven fan mounted over the main motor. The ventilating-air is drawn over the commutator, passes axially over the armature and between the field coils, and is exhausted by the fan through a suitable duct to the atmosphere.

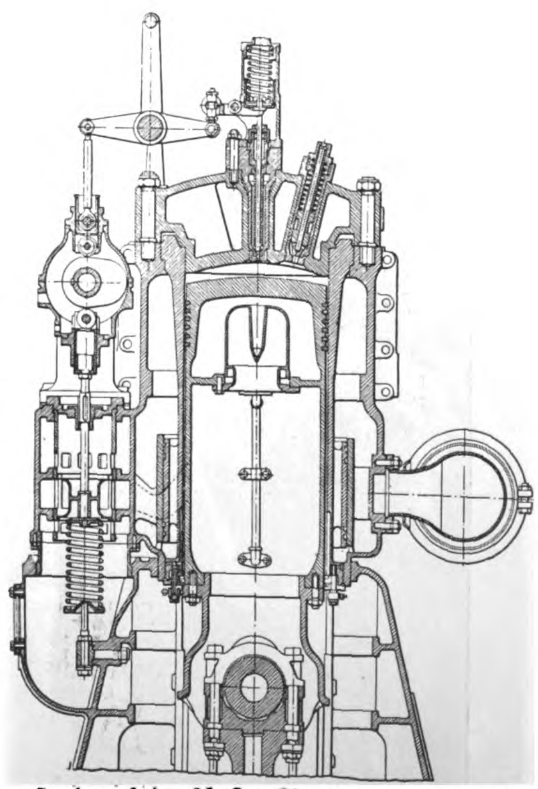
The main control-equipment consists of a control panel on which are installed the switches, generator-field rheostats, and instruments; a master controller for operating the contactors of the control group; a control group for starting and reversing the motors; a starting resistor for the motors; and a resistor in the motor fields for speed variation between 60 and 90 R.P.M. when operating with one generator.

By proper switching either one or both generators can be used to supply power to the motors. When using both generators for propulsion either one, as selected, is kept at constant normal voltage to supply excitation current to the fields of the generators and motors, and current to the blower-motor, auxiliary-panel and control-circuit. The voltage of the other generator can be varied to obtain range in speed between 105 and 120 R.P.M. In case speed variation between 90 and 105 R.P.M. is desired, then the series field of the generator not being used to supply excitation and etc., is cut out by a switch provided for that purpose.

For speeds below 90 R.P.M. and down to 60 R.P.M. one generator only is used for propulsion. The above methods are the normal op-



Wiring diagram of electric-machinery of the motorship "Fordonian"



Section of Ansaldo-San Giorgio working-cylinder

erating conditions. The actual R.P.M. under any given conditions would depend on the loading and general condition of the vessel, therefore, all R.P.M. given are only approximate. For emergency operation, bolted links are installed in the buss connections so that various special combinations of generators and motors can be made.

Protection is provided against overloading by an overload relay, this relay operating to open the main line contactors in case of excessive current. Provision is made for the operation of the main-line contactors machanically. If mechanical operation of the main-line contactors is used they are held open by a cam which prevents their operation by the overload relay.

Instruments provided on the panel consists of a voltmeter and ammeter for each generator, motor-field ammeter, and a continuous indicating R.P.M. meter.

Variation of the generator-field is obtained by a rheostat mounted above the switching-panel, and operated from a handle on the panel connected by chains and sprockets. Variation of the motor-field for speed control is obtained by resistor connected to the motor-fields, which are connected in parallel. The value of this resistor in circuit is changed by operation of the master-controller on the eighth to nineteenth notches (inclusive).

The master-controller has one main and one reversing handle. The main handle has an "off" position, "re-set" position, five motor-starting contactor positions and twelve motor-field resistor positions. The reversing handle has three positions: "ahead," "off" and "astern." The two handles are interlocked so that the main control-handle cannot be moved beyond the overload relay "re-set" position unless the reversing handle is in either the "ahead" or the "astern" position. Also the reversing lever cannot be moved unless the main handle is in either the "off" or "reset" position.

To start the motors after the switch set-up has been made, according to the speed desired, the main control-handle is moved to the "re-set" positions. The reversing-lever is set on "ahead" or "astern" according to the direction desired and then the main control lever moved successively to points 1, 2, 3, 4 and 5.

To reverse the motors the main handle is thrown to the "reset" position. The reverse lever may then be thrown, after which the main handle is advanced as in starting.

The almost total absence of interlocks to prevent possible damage is noted. Dependence is thus placed on the knowledge of the operator for proper switching. This is a question which should be given serious consideration in view of the changing personnel usually encountered in marine engineering. In Navy installations, interlocks to prevent possible damage are used wherever practicable and it is believed that their extra cost is warranted. The entire electrical equipment operated perfectly during the trials and performed up to rating without casuality of any kind. The operator was experienced and thoroughly understood the switching so that all signals were answered promptly and without mistakes. On this page is given a diagrammatic view of the wiring.

Auxiliary Equipment

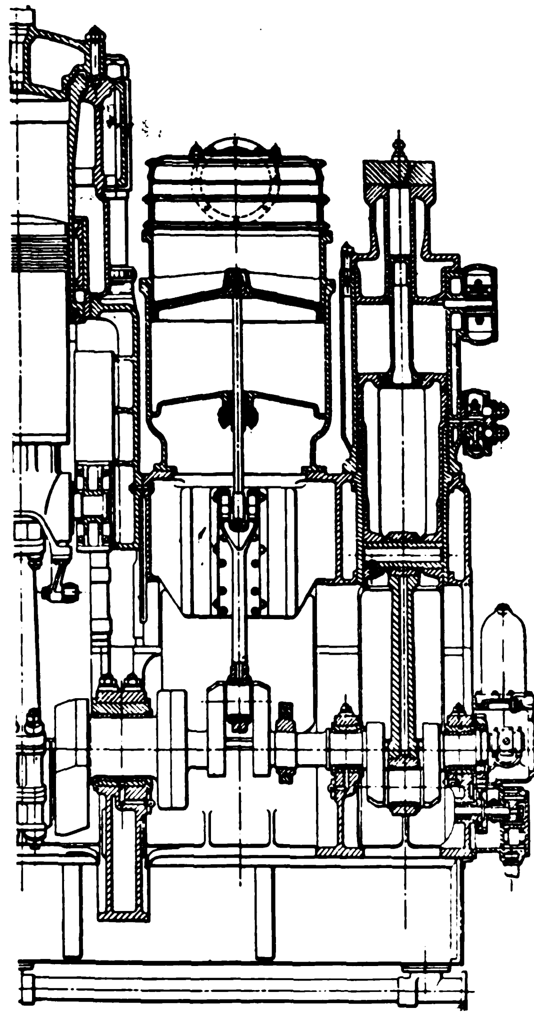
The auxiliaries consist of the following units:

1—10 H.P. motor driven, 400 G.P.M. circulating-pump.

1—5 H.P. motor driven 5 x 8 inch vertical, triplex single-action fuel-oil pump.

1—10 H.P. 6 x 8 inch vertical, triplex, single-action fire-pump.

1—25 H.P. Venn Severin vertical, single-cylinder, surface-ignition oil engine, direct connection to 15 K.W. generator, 250 volt, direct current.



Section of scavenge-pump and air-compressor of Ansaldo-San Giorgio engine

1—9 H. P. Venn Severin vertical, single-cylinder, surface-ignition oil engine, direct connected to 6 K.W. generator, 125 volt, direct current.

2—Ansaldo-San Giorgio vertical, single-cylinder, surface-ignition oil-engines, direct connected to air-compressors.

If the United States is to compete successfully for her share of world shipping, some means must be found to off-set the higher rates of pay for American seamen, and the Government Laws regulating shipping. One of the largest items of expense incurred in ship-operation is for running the propelling-machinery, which includes both the necessary personnel and the fuel. Development of the heavy-oil engine for ship propulsion is doing more to reduce these items of cost than any similar single advance in marine-engineering.

The "Fordonian" will operate on about four-and-one-half tons of oil per day at full power, and a total engineering personnel of seven men. These figures are based on tests of a similar Ansaldo-San Giogio engine, which showed a fuel consumption of about 0.43 lb. of oil per brake horse-power hour at full load. The fuel used had a specific gravity of 0.905, a calorific value of 19,800 B.T.U., and carried bituminous impurities to the extent of 25 percent. These figures, considering the nature of the fuel, are considered very good. Compare the expected performance of the "Fordonian" with the best boiler and steam operated ship of the same tonnage and power and the tremendous saving over a long period of time will be readily apparent.

The first question which naturally arises is: "Why not use direct-connected Diesel-engine drive instead of Diesel-electric?" This is a question which can be answered definitely only after severe service test. Even then it will probably be found that the type of drive best suited for a given ship will depend upon the type of ship, its trade route, and cargo carried. It will also depend on the state of development of the different types of machinery available at the time.

A bright future for the Diesel-electric drive is predicted, based on the success of this installation, due to its manifold advantages when installed where these factors can be untilized.

For a ship of the "Fordonian" type certain advantages are gained by adopting the Diesel-electric drive. Reliability should be given first consideration in selecting the type of machinery. It is considered that the use of Diesel-electric drive gives marked reliability over the direct connected Diesel. This is mainly due to the absence of the reversing feature. In reversing a Diesel-engine high-pressure air must be used which sets up severe strains in all parts of the cylinders, cylinder-heads, and pistons due to the wide and rapid temperature changes.

Submarine-engine operators of the Navy have had long and severe experience in the operation of Diesel-engines, and are almost universal in stating that they attribute the greatest part of their trouble of cracked cylinders and cylinder heads to this feature. While the reversing has been worked out so that it can be accomplished readily and reliably it introduces hardships on the engine.

A comparison might be made to the use of the turbine for marine and land practice. The fact remains that the troubles and casualities experienced on the marine turbine far outnumber those experienced on land installations, and yet the major difference is only that one is reversing and variable speed where practically all on land are for constant speed and run in one direction. The fact that in the Diesel-electric drive the engine always operates at constant speed and in the same direction, is considered its biggest advantage and one which affords maximum reliability. In order to gain the full advantages of electric drive the engines should have been fitted for electric starting, air-starting being used on this ship.

By the use of the Diesel-electric the most efficient speed of both the engine and the propeller may be selected. The relative number of engine units and propellers are also independent so that within limits the size of the engine units and the number of propellers can be chosen to best meet the conditions. For a ship of the "Fordonian" type a single propeller will show marked economy over two, yet if one direct-connected Diesel-engine were used there would be a marked falling off in the ship's reliability. The gain in economy by using the latitude in selection, as indicated above, will about balance the power lost by the use of electric transmission.

The use of electric-drive affords a flexibility of control and consequent maneuvering characteristics of the ship which are afforded by no other means. The selection of the type of electric-control allows some latitude. One type is not suitable for all installations. Generally it is believed the type of control for speed changes, previously described and installed on the "Fordonian," is not the best.

Where more than one generator is installed it is accepted that series operation of the generators, as used on the "Fordonian" is the best.

Maintaining a constant speed of the propeller in a seaway is desirable and is obtained automatically by electric drive due to the governor regulation. While not taken advantage of on the "Fordonian" the use of electric drive allows a wide latitude of distribution of the main drive units.

Once an experimental installation of this type is made the developments towards simplification and type of apparatus is very rapid. This has been the history of the development of the turbo-electric drive in the Navy. The economy, reliability, flexibility of control, and design of machinery, for the latter type of Naval ship having turbo-electric drive is far superior to those first built

Doxford's Engine and Boiler-Oil

A Well-Balanced Discussion That No Shipowner or Engine-Builder Should Fail to Read

By J. L. CHALONER

WHEN the chapter dealing with the "development" period of the marine oil-engine becomes the subject of serious consideration, it will be found that an important place will have to be allocated to the Doxford oil-engine. Since the February issue of MOTORSHIP was issued, the Vice-President of an important American shipyard sailed for England to close a deal for the United States constructional rights for this marine Diesel motor. The early investigations and experiments at the Pallion Yard of William Doxford & Sons, Ltd., were along a very thorny path, although it was realized from the very beginning, *i.e.*, as far back as 1908, that the oil-engine was the prime-mover of the future mercantile-marine. Once convinced of the truth of this prediction, this firm at once made up their mind to build a practical and sea-worthy oil-engine, and only then set about to find out how this proposition could be accomplished.

From 4-stroke to 2-stroke, from single-acting to opposed-piston, from high-speed to slow-speed, from air-injection to mechanical-injection, from high-compression to medium-compression, such were some of the radical changes forced upon this firm on account of the persistency with which they persued their original policy: A sound, practical sea-going job.

Those who have followed the development of this engine through several articles in these pages will remember the trials which were carried out in 1914 on the 500 h.p. single-cylinder unit under Lloyds supervision. With a 35-days continuous trial under varying conditions—as far as test-bed conditions would permit—a standard of shop testing was established, which at once indicated the serious attention and concentration, which has been an outstanding characteristic of this firm during their career as marine oil-engine builders.

In those early days the compression was the the only serious source of trouble, and it is decidly refreshing to see the initiative and courage displayed during the period of "evolution" to be rewarded to such a full extent.

But, it was not always the question of mechanical details, which pre-occupied the consideration of this firm. The writer well remembers one of the most interesting discussions, which it was his privilege to have with Mr. Robert Doxford and Mr. K. O. Keller in 1914. The particular subject was fuel specifications and the desirable degree of flexibility of an oil-engine with specific regard to the widest possible range of suitable, *i.e.*, commercial fuels. Whilst gas-oils (solar oil) were then considered as good allround fuels for marine oil-engines, Doxfords had already looked past the "Diesel grade" to boiler-fuel as the most effective means of establishing the superiority of the marine oil-engine over any other type of prime mover.

It was part of the program of research to determine the flexibility of the experimental unit with regard to heavy viscous fuels. All arrangements had been made to carry out a 14-days' trial on a standard grade British fuel-oil (Mexican 0.950 gravity fuel-oil), but certain war regulations prevented the actual tests being carried out. The whole incident, however, goes to prove that even in those days Doxfords were confident of having evolved a design, with which could be demonstrated the suitability of low-grade fuels.

Years of further research and study have passed, the practical results of which are embodied in the 3,000 horse-power single-screw unit, which completed on December 24, 1921, the seven-days' trial on the test-bed prior to being placed on board the motorship "Dominion Miller," completing for Messrs. Furness Withy, the sea trials of which were scheduled to take place during the first week of January. Apart from steam-driven auxiliaries the engine is similar to that on board the "Yngaren," which has already proved her sea-worthiness in a most satisfactory manner.

We are not prepared here to enter into any controversy regarding the merits or de-merits of a twin job from the point of view of increased propeller-efficiency or any other point. All we are concerned with is to emphasize the practicability of the single-screw proposition. Our views are largely governed by the attitude of a large body of ship-owners who would not for any consideration interest themselves at the present moment in anything but a single-screw ship regardless of merits or claims for a twin-screw installation. The demand for tonnage of 8,000 to 10,000 tons cargo boats with a slow propeller speed and of 10 to 11 knots, is far greater than for any other class, particularly because of prospective conversion work. With the Doxford engine we have today a suitable power unit.

> In our December issue we discussed the importance of all domestic Diesel-engine marine installations being designed to burn the heavy boiler-fuel oils under ordinary sea conditions. Already the American motorships H. T. Harper, Charlie Watson, Babinda, Benowa, Boobyalla, Texaco, Solitaire, Kennecott and several others are regularly using boiler-oil of 14 to 18 degrees Baumé with unquestionable success. Mr. Chaloner,— who is an authority on oil,—further dwells on this topical subject in his excellent contribution on this page. Comments are given on our Editorial page.

It is imperative to study the requirements of the shipowner and appreciate his conservative attitude. The ship-owner of today is only inspired with confidence in connection with any novel departure from convential lines by retaining certain essential features of a power unit to which the owner and his marine-superintendent look for reliability and service, to say nothing of the economy factor. Such an initial attitude will enable the builder to employ at a later stage a "penetrating" progressive development policy, whereby he may demonstrate to the owner the fullest extent of the superiority of the oil-engine in every direction.

The writer has seen shipowners standing aft on a twin-screw motor vessel and looking over the stern during maneuvering operations. "Still a very long way to go" appeared to be an apt remark. Not so with the Doxford job. In fact it was agreed amongst a number of critical observers during the basin trials of the "Yngaren," that the ship came on to the ropes even more gently than would be the case with a similar sized steam-vessel.

Minor points such as these do not escape the searching and critical eye of the owner, and in fact, help more in leaving a fair impression of the practicability of the modern oil-engine, than other more apparent but less important points.

In the present "development" period of the marine oil-engine industry, it is essential to create the right atmosphere, because with the exception of those closely connected with the industry, very few people have a clear conception of the rapid strides which have been made in the last few years. There are still too many people who base their criticism of marine oil-engines on impressions gathered many years ago.

Referring now to the latest development of the Doxford-engine, we must at once record that the seven-days' trial of the second engine built at Sunderland was run on standard-grade boiler-fuel. This achievement reflects additional credit on a firm which is playing such an important part in the progress of this great industry. We are brought nearer materially to the day when it will be universally regarded as a wasteful practice to burn under boilers in a highly inefficient manner a fuel that could be burnt to greater advantage in an oil-engine.

The question of heavy residual-fuels for oil-engines is an important one. Indeed it is receiving careful attention at the hands of all interested parties. The author admits that almost every heavy oil-engine can burn a residual fuel, but there still remains in many cases the important question as to how long any particular engine can run on a low-grade oil, and remain a cheap, reliable and economical power producer.

Another fallacy appears to be that some engine-designers are more concerned with the problems of handling the viscous grades of fuel than with the burning of the oil inside the engine. Let it be suggested at once that if oil-burner manufacturers had taken-up the same attitude and with them it is entirely a question of the lowest, *i.e.*, most viscous grade of oil there would not be today 20 per cent. of the mercantile-marine fitted with oil-firing equipment. Surely the handling of viscous fuels on board a vessel are identical irrespective of the power unit being steam or oil-engine?

Why is it thought desirable to shift the responsibility for the unsuitability of heavy and cheap fuels when the engine-builder anticipates no trouble from his engine's point of view? Mr. Blache of Burmeister & Wain in his recent lecture stated that more than 25 per cent. of the bunker must remain in the double-bottom tanks. With this statement the writer is in entire disagreement.

Heating-coils are a convenient means of overcoming any difficulty; effective transfer systems have been evolved, whereby the fitting of heating-coils becomes superfluous. Steam is not available as readily on board a motor-vessel; but, with a modern continuous circulating system, quite an effective heating of the fuel-oil to a suitable temperature can be accomplished. The jacket-water on leaving the cylinder-head can be boosted up by the

exhaust-gases, and would then have reached a sufficiently high temperature to act as a heating agent of the oil.

At any rate, whatever the problem is, we feel sure that as soon as the engine is evolved which by using low-grade fuels will show a higher over-all economy without impairing its reliability, the handling of viscous fuels will in no way deter or retard the practical application of this scheme. Doxfords have realized that the primary factor and one deserving concentrated attention is that of flexibility of the engine with regard to a wide range of commercial fuels. The problem of suitable bunker design is one of secondary consideration.

Coming now to the actual trials we are glad to record that (as far as observations based on a seven-days' test-bed go) the results are highly satisfactory. An analysis of the oil is appended, and from its examination it is quite apparent that a total percentage of asphalt of 14.4 per cent. constitutes conditions which hitherto have been considered as extremely severe.

In passing attention is drawn that the precipitation method has been used for the determination of the asphalt percentage instead of the evaporation method, which is not only inaccurate, but does not give concordant results. The engine ran chiefly at normal power, *i.e.*, 2,600 b.h.p., with the exception of several periods when owing to the scarcity of water the load had to be reduced. (For full power the Heenan & Froude dynamometer requires approximately 60 tons of water per hour.)

For a short period also the Aspinall governor was connected-up to show the behavior of the engine in rough weather. The governor controls the lift of the suction-valve of the main fuel-pumps, and thereby has the speed of the engine in hand in a simple yet perfect manner. The condition of the four pairs of opposed pistons left nothing to be desired, they remained remarkably bright throughout the trial, and there was not even the slightest trace of that tarry deposit, which is often experienced with such grades of fuel.

On opening the exhaust cocks there was an entire absence of those glowing carbon particles which one is accustomed to observe under similar conditions, and a further proof of the completeness of combustion was the low exhaust temperature and the invisible exhaust. The exhaust temperature varied between 560 degrees and 600 degrees F., and there was only a blue tint to be discerned in the exhaust-gases as they escaped from the funnel.

However satisfactory the results are, they are at any rate to the writer not of a surprising nature. In our experience we have found that the airless injection system has proved particularly effective in connection with the burning of asphaltic oils. The cooling effect of the expanding air-blast at a moment when all available heat energy is required to complete the combustion of the more complex hydro-carbon molecules is a serious drawback. At the same time it cannot be denied that with increasing size of cylinder the mechanical-injection gear becomes simpler in design.

As regards specific adjustment when running on heavy fuels it should be noted that beyond a slight alteration in the fuel-valve timing and an increased injection pressure, nothing is required once the oil has reached the fuel-valve. The timing was slightly in advance of that for standard grade Diesel-oil, and from the log sheet it will be observed that the injection-pressure had been raised to about 11,000 pounds per square inch. It is particularly noteworthy that these adjustments can be carried out without entailing the shutting-down of the engine.

It has been suggested that these somewhat high injection-pressures are a draw-back, chiefly on account of keeping the whole injection system tight. We learned from the builders that to demonstrate this point the main and auxiliary pump and injection systems were kept under pressure for 48 hours without even the slightest drop in pressure.

For the same reason there might have been anticipated a certain amount of trouble to keep the fuel-valves properly tight. However, at no time has it been found necessary so far to grind in a fuel-valve, either on this or the previous unit. This observation speaks well for the care and attention which must have been devoted to the production of a sound practical design of this important mechanical detail. Regarding the fuel, arrangements have been made to heat it in the settling tanks whence it passes through a system of well lagged piping to the fuel-pump through a set of filters on both the suction and delivery side of the pump. It is of particular interest that the temperature of the oil on entering the fuel-valve casing was kept at 130 degrees F.

During the seven-day shop trial of the first engine ("Yngaren's" machinery) and running on standard grade Diesel oil the consumption was 0.44 pound per b.h.p. hour and 0.376 pound per i.h.p. hour. These results compare unfavorably with those recorded in connection with these trials and quoted on the appended log sheet. Therefore it is apparent that certain improvements have been made, which without being obvious to the less critical observer, are responsible for this material reduction in fuel consumption. In fact it would appear that for similar grades of oil there has been made possible with this engine a reduction in the fuel-consumption to the extent of nearly 10 per cent. (See Appendix No. 2.)

Examining now the possible saving in the fuel-bill, when using the standard grade of Diesel oil and low grade boiler-fuel we find the following conclusions. Taking two similar running periods of 200 days per annum with a fuel-consumption of 12 tons in boiler fuel, and 11½ tons when running on Diesel oil. (Owing to the higher calorific value of the Diesel grade and owing to its superiority generally we may assume a reduction in the fuel-consumption in favor of the Diesel oil to the extent of 4 to 5 per cent.)

The annual fuel-bill when using the lower grade is reduced by about $12,000, *i.e.*, approximately 25 per cent. of the total fuel cost, depending on the changing cost of oils. If the running and maintenance charges be kept proportionally low—and this is the factor on which further evidence must be collected before giving a definite opinion—there is before us a commercial proposition which deserves that concentrated attention, which is prevailing at the present time in manufacturing and shipping circles. At any rate Doxfords have once more struck the right note in investigating this problem from the engine-builders' point of view and retaining its importance in the correct perspective. These tests are bound to have a marked influence on the whole problem of boiler or furnace oils for marine oil-engines, inasmuch as they indicate that a practical solution is at hand.

It is now up to the shipowner to show his confidence in the practicability of this scheme by providing facilities to demonstrate the reliability of this commercial unit in general and its flexibility with regard to the widest possible range of commercial fuels in particular.

APPENDIX No. 1.

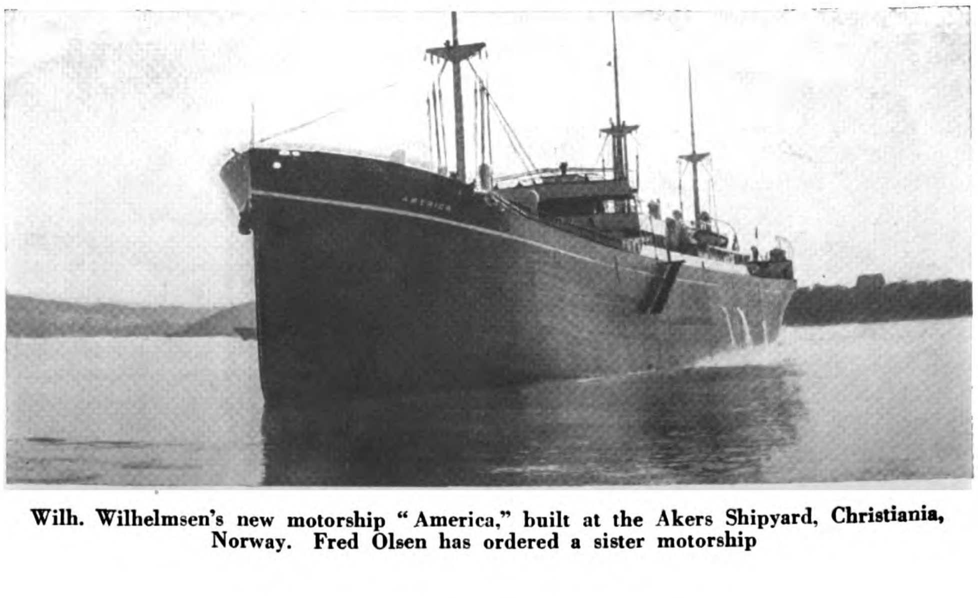
Specific Gravity at 60° F. 0.943
Flash Point (Pensky-Martens, closed) . 185° F.
Viscosity Redwood No. 1 at 40° F. 10,750 secs.
Viscosity Redwood No. 1 at 100° F. . 600 secs.
Setting Point . . . . 80° F.
Calorific Value, gross . . . . 18,860 B.Th.U.
Calorific Value, net . . . . 17,770 B.Th.U.
Ultimate Analysis—
Carbon 85.2%
Hydrogen 11.2%
Sulphur 3.4%
Oxygen and Nitrogen (by difference). 0.2%
Water and Sediment 0.6%
Ash 0.07%
Coke 10.0%
Asphalt (by precipitation method)
Total (Alcohol-Ether) 14.4%
Hard (Insoluble in 100° C. Naphtha). 10.5%

We are indebted to the Anglo-Mexican Petroleum Co., Ltd., of London, for the above analysis.

Appendix No. 2

Average Results Over 7 Days' Trial Taken from Engine Log of 3000 H.P. Doxford Engine on Mexican Fuel

I. H. P. 3146
B. H. P. 2540
Revolutions per min. 7.62
Indicated mean-effective pressure. . . .
109.4 lbs. p. sq. in.
Brake mean-effective pressure 88.2 lbs.p. sq. in.
Mechanical efficiency 80.6%
Consumption of Fuel-Oil:
per 24 hours . . . . 11.34 tons.
per B. H. P. hour . . . . 0.417 lb.
per I. H. P. hour . . . . 0.336 lb.
Fuel Valve injection
pressure . . . . 10,800 lbs. p. sq. in.
Oil temperature (before fuel-valve) . . 130°F.
Water circulating temperatures to
cylinder and pistons . . . . 145°F.
from cylinder . . . . 175°F.
from piston . . . . 165°F.
Lubricating-oil pressure . . . . 18 lbs. p. sq. in.
Lubricating-oil consumption for pistons
and all other purposes . . 11.9 gal. p. 24 hours.
Scavenging-pressure . . . . 2.5. lbs. p. sq. in.
Exhaust gases:
Temperature . . . . 570°F.
Color: Very faint blue tint only visible against dark background.



Wilh. Wilhelmsen's new motorship "America," built at the Akers Shipyard, Christiania, Norway. Fred Olsen has ordered a sister motorship

The motorship "Handicap," 9,000 tons d.w.c. She is Norway's largest merchant-vessel. Her power consists of twin Sulzer 1,350 shaft h.p. two-cycle Diesel engines. Her speed on trials was 13 knots at 110 r.p.m.

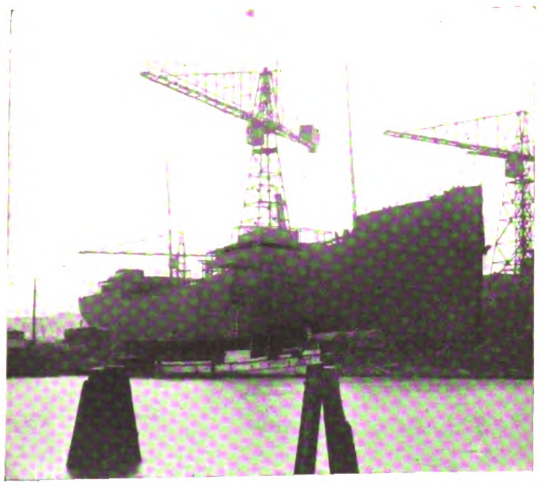
LAUNCH OF TRANSATLANTIC CO.'S MOTOR TANKER "OLJAREN"

Electric Driven Cargo Pumps Being Installed

It is not very widely known that the first steamer carrying oil in bulk was built in Sweden, namely, the SS. "Petrolea," built in Göteborg at the end of 1880. This vessel was later renamed "Ludwig Nobel" and sailed with oil on the Baltic Sea. The vessels for carrying oil, which had previously been built, were not constructed as tank-boats throughout, but were only fitted with a few tanks, or in some cases with "loose" tanks.

A Diesel-driven tank-vessel of 6,800 tons on the Isherwood system was built in 1915 at Götaverken for Nobel Brothers in Petersburg. This vessel it may be recalled was sold to Norway during the war and renamed "Hamlet." A tank-vessel now in building at Götaverken was launched on December 17th and was named "Oljaren." She is being built for the Transatlantic Company in Göteborg, and is the fourth motorship built by Götaverken for that firm. The "Oljaren" is built to the highest class of British Lloyd and also is constructed on the Isherwood system. Her principal dimensions are:

Length (o.a.)	394′ 3″
Length (b.p)	380′ 3″
Breadth (moulded)	55′ 0″
Depth to maindeck	30′ 0″
D. W. Capacity	7,500 tons



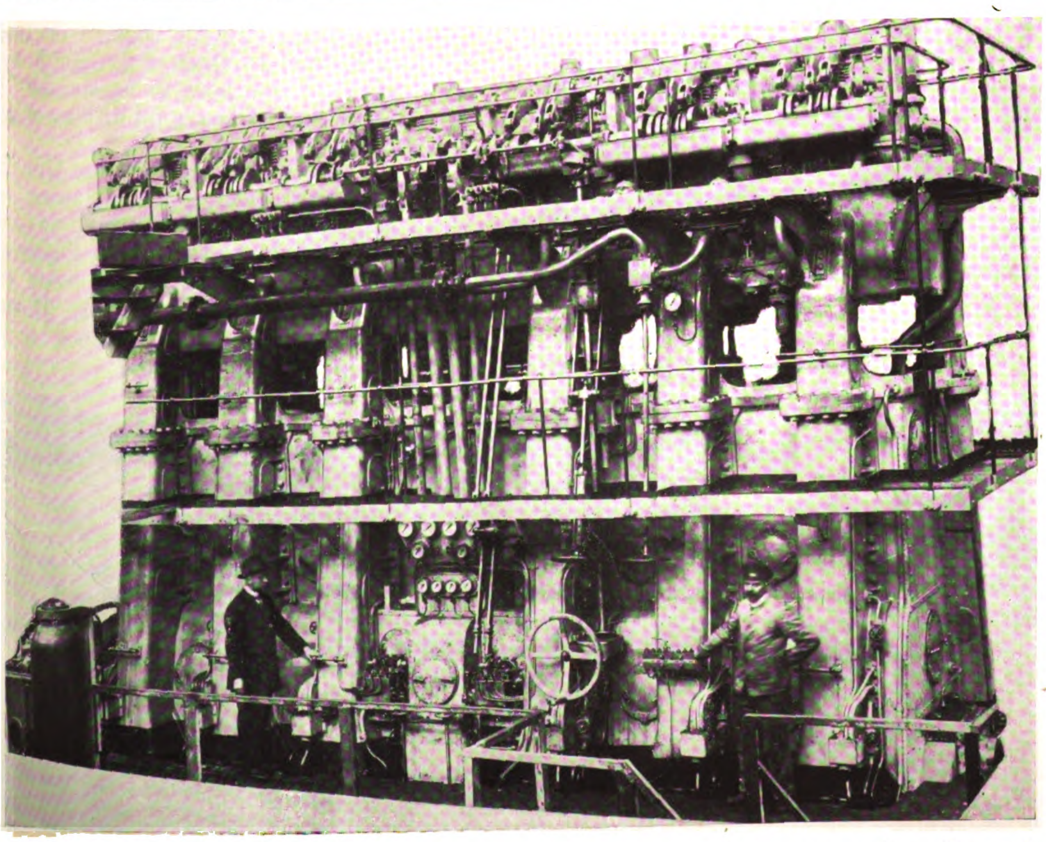
The Rederi Transatlantic's new Diesel-driven tanker "Oljaren," just prior to her launching at the Götaverken, Göteborg

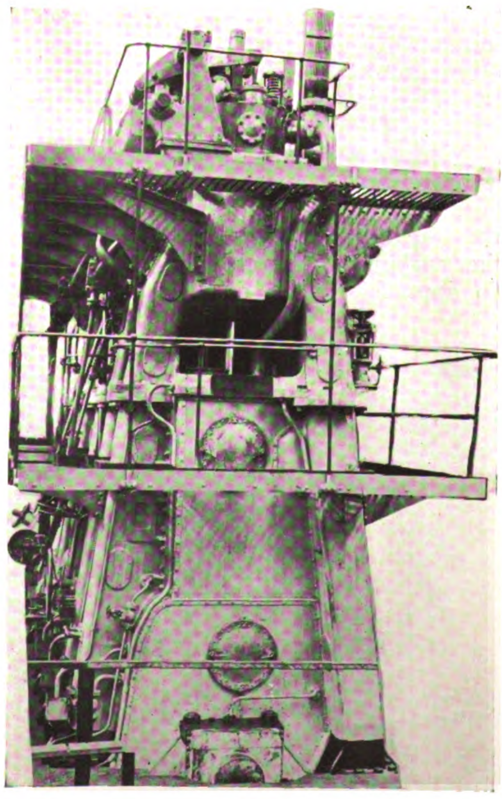
The machinery consists of two of Götaverken's B. & W. Diesel motors of 2,800 i.h.p. and the speed is calculated at 11 knots.

Of special interest is that the cargo-pumps as well as the winches, windlass and steering-engine are electrically driven, the pumproom being next forward of the machinery-space, and the pumps connected to the motors in the engine-room by means of a shaft running through the dividing bulkhead.

TRIALS OF SULZER-POWERED MOTORSHIP "HANDICAP"

In our last issue the big Norwegian-built motorship "Handicap" was described. Trials of this new vessel were recently run with every success, and an average speed of 11¾ knots maintained with her twin Sulzer two-cycle Diesel engines averaging 97 r.p.m. With the engines operating at overload and turning at 110 r.p.m. a speed of 13 knots was attained. The fuel-consumption worked out at 9.4 tons for 24 hours, including for all auxiliary machinery, also for the electric-galley, lighting and heating. On deck she has 12 Asea electric winches of which four are of five tons capacity and eight of three tons.





The new Deutsche Werke 950 shaft-horsepower Diesel marine-engine. On another page is given a sectional view

Diesel Engines Farthest North

Interesting Oil-Engine Installation in Alaskan Work-Boat

By S. R. HUNTER and E. W. BOWNESS

DURING the early part of 1921, the Dodge Sales and Engineering Company delivered two 75 H.P. marine oil engines to the Northern Trading Company, through their northwestern representatives, the Empire Engineering and Supply Company. The following story will give a very good idea of the requirements and service to which these engines are put.

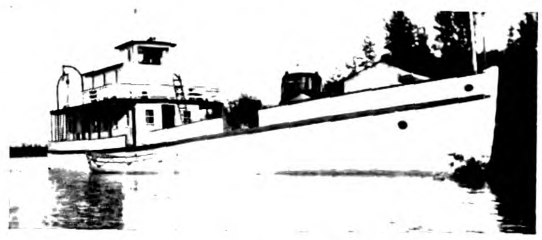
Those of you who read the "Saturday Evening Post" will remember a story recently published in two serial installments entitled "End of Steel." This story, from the pen of Hal. C. Evart, and that of Hawthorne Daniel entitled "The Canadian Oil Rush Limited," which appeared in the November and December issues of the "World's Work," very clearly and in a very interesting manner describe that portion of the pink area of the map so favored by "movie" producers as "the last Great West." Here, lying between the eastern boundary of Alaska and Hudson's Bay, with the Arctic Ocean on the north, and bounded by the 60th parallel on the south, is the Great Northwest Territory of the Dominion of Canada.

This territory is greater in area than all of the United States lying east of the Mississippi River, and is divided by a series of lakes and connecting rivers into two parts, the principal river being the Mackenzie, which for a distance of about 1200 miles flows in a northwesterly direction and empties into the Arctic Ocean. This river is navigable for its entire length and on the banks of this river at one of the last outposts of civilization in America is located the oil well which has served to supply the impetus which has resulted in the greatest migration to the Northwest since the Gold Rush to Alaska.

To the Eskimos, Indians and trappers of the Canadian Northwest, the "bringing in" of an oil gusher near Fort Norman was a commonplace event compared with at least two other events as a result of this oil gusher. These people had for many years been familar with oil, which seeped from the ground and covered lakes and rivers with a thick scum, and they had used this oil for fuel and other purposes. The arrival of the big metal airships or "Flying Devils" of the Imperial Oil Company, was the first event following the oil strike which caused wonder and some consternation in native villages and at trading posts. The second event, long to be remembered, was the arrival of the large freight boat "Northland Pioneer," with no smoke, little or no engine noise, and equipped with engines which used this crude-oil as fuel, and, unlike the familiar gasoline engines, had neither carburetors nor electric batteries.

To appreciate some of the difficulties of this installation of Dodge engines in the Canadian "Farthest North," it is necessary to get a rough idea of the conditions leading up to this installation, and of the great country in which the introduction of modern methods of water transportation is but a part of an immense present and prospective development.

For over one hundred years fur trading has been carried on with the Indians and Eskimos along the Mackenzie River and its tributary lakes and streams, and from time to time explorers and scientific investigators have brought out reports of indicatons of immense oil and mineral wealth. In 1789 Sir Alexander Mackenzie, a noted Scotch explorer in the employ of the North West Company, who first traversed the river which now bears his name, reported oil seepages at various points along the river, and it was at one of these points near the trading post of Fort Norman, one hundred and fifty miles from the



The "Northland Pioneer"

Arctic Circle, that the oil gusher was struck in September, 1920, which has drawn world-wide attention to the Mackenzie District.

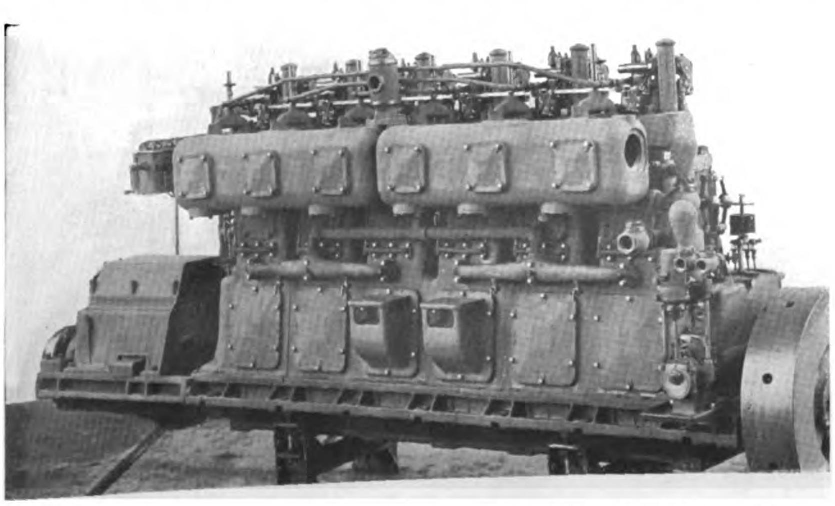
A glance at the map of this district will show that the two great feeders of the Mackenzie River in Alberta—the Peace and Athabasca Rivers—are connected to Edmonton at Peace River Crossing and Fort McMurray, respectively, by railway. From these railway termini or from what is known in the north as the "End of Steel," river and lake transportation is possible to the Arctic Ocean. Between Fort Fitzgerald and Fort Smith on the Slave River, however, is sixteen miles of rapids which are not navigable, and it is therefore necessary to portage all freight and passengers from boats which operate on the Upper Waters—or from "End of Steel" to Fort Fitzgerald—to boats which operate on the Lower Waters, or from Fort Smith to the Arctic Ocean. On these rivers and lakes the trading companies, the Hudson's Bay Company, the Northern Trading Company, and, since 1914, the Lamson-Hubbard Canadian Company, maintain a line of boats by which supplies are taken in to their northern trading posts as soon as "break up" of the ice in the Spring, and furs brought out before "freeze up" in the Autumn.

The picturesque scarlet coated Royal Canadian Mounted Police maintain stations in the Mackenzie Basin from Edmonton to the Arctic, and make periodic water and land patrols to administrate justice without fear or favor to Eskimo, Indian and white trader alike, and at practically all trading posts Missionaries are stationed. At least one mail delivery was made by dog team between "freeze up," which usually comes in October, and "break up," which usually occurs in June. That winter travel is not as difficult as might be imagined is shown by the fact that over sixteen men traveled by foot and dog team via the river route from Fort McMurray and twenty from Dawson City through the mountain passes to stake oil claims during the winter of 1920-1921.

The news of an oil strike in the Autumn of 1920 brought enquiries from all over the world to the trading and transportation companies for passenger and freight service to and from the new oil field. In addition to the oil strike, rich stores of gold, silver and lead had been discovered on the Great Slave Lake, iron on Lake Athabasca and salt on the Slave River, and the immediate development of the well known immense fish resources of all the Northern Lakes was contemplated. It therefore became evident to the transportation companies that a system which was quite adequate for carrying supplies to trading posts and bringing out the winter's fur catch would not prove adequate for the anticipated passenger traffic, and for the transport of oil drills, boilers, engines, stamp mills and other heavy machinery which the prospective development would require.

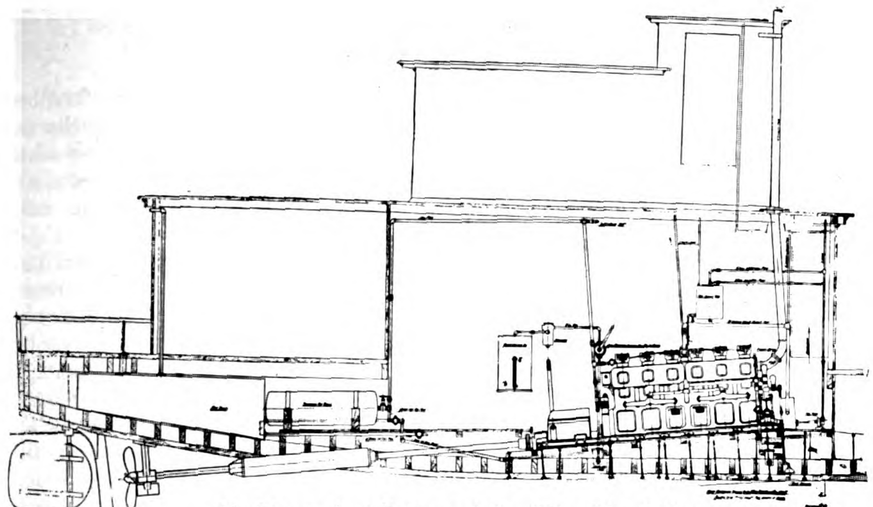
The Northern Trading Company is practically a newcomer in trading and transportation operation in the North, when its twelve years' operation is compared with the one hundred and fifty or more years of the Hudson's Bay Company. Immediately following the oil strike in September, 1920, it was decided to build a freight boat to operate on the Lower Waters from Fort Smith to the Arctic Ocean, this boat to be specially built for the handling of heavy oil drilling and similar machinery.

All the larger boats on both the Upper and Lower Waters were steamers using cord wood for fuel. This cord wood was cut at convenient points and piled on the river or lake bank to be loaded on the boats as required, the number of fuel stops depending



One of the two 75 b.h.p. Dodge oil-engines of the "Northland Pioneer"

Loading the "Northland Pioneer" at Fort Smith



Machinery installation of the "Northland Pioneer"

on the deck space available to store fuel and the economy of engines and boilers. The time of fuel loading depending on the number of passengers and their ability and willingness to assist the crew in this work. It is evident, in any case, that not only was considerable time lost during each trip, but also that considerable cargo space was also wasted to provide room for cordwood fuel. As a fair example, the trip from Fort Smith to Fort Norman by one of these steamboats takes ten days under ordinary conditions, twenty-five to fifty hours of which is taken up in loading cordwood at the fueling points. Each of the three companies mentioned also operates several smaller screw-driven gasoline boats on shorter runs between posts on the main route, and to posts on tributary rivers and lakes. As the gasoline for these smaller boats, however, costs from $1.50 to $2.00 per Imperial gallon when delivered at the Northern Posts, gasoline engines for the larger boats on the main runs were out of the question.

Oil-fired boilers were also thoroughly investigated by Roy Nurse, the company's engineer, and eliminated on a comparison of operating costs and reliability, and it was finally decided to use oil engines of either the Diesel or surface-ignition type.

As the boat was to be operated on the Lower Waters, it was necessary to build it at Fort Smith below the Slave River Portage which is 225 miles from "End of Steel," and 475 miles from Edmonton. It was therefore necessary to transport all material including the engines from Edmonton to Fort McMurray over a railway, parts of which were still in the construction stage, then from "End of Steel" on this railway—a distance of three miles—by horse team to the river bank over a trail which at times was a quagmire of mud. At this point material and engines were loaded on scows and transported to Fort Fitzgerald where another portage of sixteen miles was necessary by team to Fort Smith, this portage being also over a trail which was badly cut up by heavy traffic and at times almost impassable.

With the above conditions in mind, a thorough investigation was made of a number of heavy-oil engines, and a decision was finally made in favor of twin 75 H.P. Dodge Units.

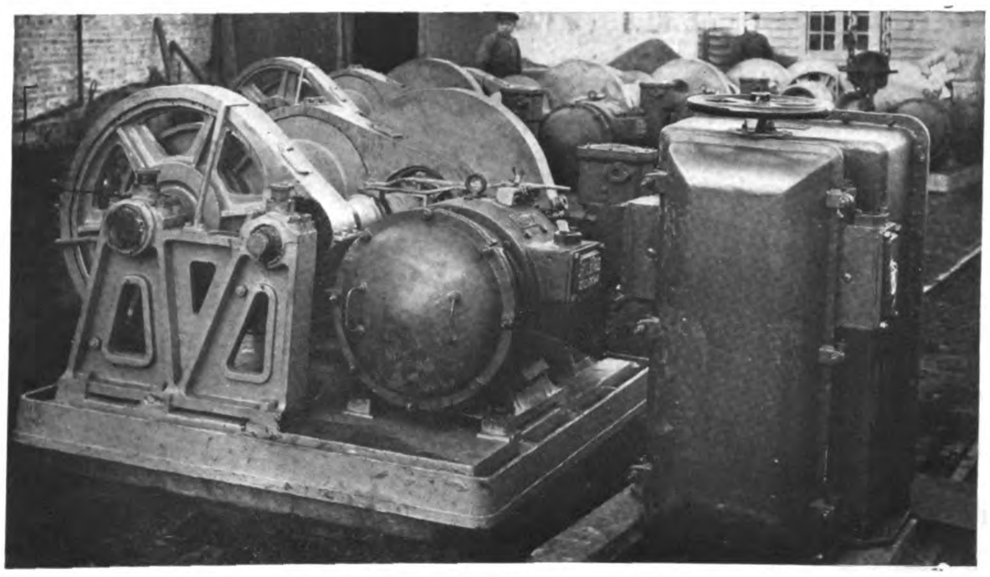
The "Northland Pioneer" to date is the largest motor-driven boat on the Mackenzie River. Some conception of her size can be had by noting the principal dimensions: Length 100 ft., beam 20 ft., and draft 4 ft. 8 inches. After the engines had been installed she left on her maiden voyage of over 900 miles in charge of Capt. John Matheson and Engineer Roy Nurse. The destination of the tug was the oil field under process of development by the Imperial Oil Company, located 53 miles below Fort Norman. The cargo consisted of boilers, well-casing, lumber, parts for the flying-boat, and a lot of miscellaneous freight to the extent of over 90 tons. In addition to the cargo, she carried as many passengers as could be accommodated and sufficient fuel for the engines. She also towed a scow loaded with 50 tons of freight. The crew beside the captain and chief-engineer consisted of two engineers, a purser and five deck-hands.

During the early part of the trip the boat encountered a very severe storm on the Great Slave Lake, which not only proved very trying on the skill of the boat's crew, but on the stability of the engine and the boat as well. The trip of over 900 miles was made, in spite of the storm, without mishap, speaking volumes for the reliability of her oil engines.

DANISH ELECTRIC CARGO-WINCH

From Europe comes an illustration of an electric cargo-winch developed by Thomas B. Thrige, Odense, Denmark. This type of cargo-winch has been used to a great extent on motorships in Europe, and special features have been incorporated in order to render them watertight and suitable for use in exposed positions on deck. Electric winches operated by current produced by Diesel-driven generators have proved to be more economical than steam winches and their use on future American motorships is bound to be nearly universal. Therefore, our readers will undoubtedly be interested to see illustrations of one make of winch which has been installed on many European motorships and to note the details which have been developed by long experience. These Thrige electric cargo winches are manufactured in two sizes, one for a maximum load of 2,600 pounds to 6,600 pounds, and the other for a maximum load of 3,500 pounds to 11,000 pounds. Each size of winch can be made in any of three models, A, B, and C, and also can be fitted with any arrangement of whipping drums, warping ends, extended shafts, etc., to suit special requirements. Type A winches are of double and single purchase type, and Types B and C winches are built as single purchase winches. All gears have cut teeth, gears are all covered and change in motion from single to double purchase, and *vice versa,* is effected by a single movement of the clutch lever.

The motor is of reversible marine type, series wound, enclosed in watertight casing, arranged for 220 volt direct current. The controller and resistance are arranged in common in a cast-iron box which is fitted with means for access and for ventilation, at the same time preserving absolute watertightness. A powerful magnetic brake is fitted.



Danish-built electric-winch for motorships

FRED OLSEN ORDERS ANOTHER MOTORSHIP

The well-known Norwegian shipowner, Fred. Olsen, has ordered a new motorship from Akers mek. Verksted, Kristiania, the Norwegian licencee for Burmeister & Wain The new Diesel-driven ship will be a sister vessel to ms. "America," which this Norwegian shipyard built and delivered last year to the Norwegian Mexico-Gulf Line (Wilhelm Wilhelmsen, Tonsberg), who when they receive the three 10,000 tons motorships now building to their order at Burmeister & Wain's yard, Copenhagen, will control a fleet of more than 400,000 tons.

Recently Wilhelm Wilhelmsen took over the Thor Thorsen line, including the two Werkspoor-Diesel motorships "Salerno" and "San Paulo," built in Holland. These two Diesel vessels represented a fourth share of the Thoresen interest in the Norwegian-South American Line, the three other fourth-shares of which are held by Bergenske Dampskibsselskab, Nordenfjeldske Dampskibsselskab and Fred. Olsen respectively. The Thoresen portion has been taken over now by another well-known Norwegian shipowner, namely, J. Ludw. Mowinckel of Bergen, according to a statement by Director Aamundsen of Aker's on the occasion of the trial run of the "Balzac."

THREE ESTHONIAN MOTORSHIPS

"Laanemaa" the first of three iron-built 1,100 tons motor auxiliary sailing-ships was launched recently at the Nobel Lessner, Reval, to the order of the Eesti Laeva Uhisus of the same city. Her length is 188 ft. by 28½ ft. breadth and 14½ ft. depth. A 225 shaft H.P. Koerting oil-engine is being installed.

New Motorship to Have Scott-Still Engines

Alfred Holt & Co. Order Big Twin-Screw Vessel With Combination Diesel-Steam Engines of 2,500 Shaft Horsepower—Era of the "Motor-Steamer"

ONE of the most interesting orders of 1922 is that embodied in the contract just placed by Alfred Holt & Co., Liverpool, England, with the Scott Shipbuilding & Engineering Company of Greenock, Scotland. This consists of a twin-screw motorship of 400 ft. length, 52 ft. breadth, and 32 ft. depth to be propelled by two 1,250-shaft H.P. Still combination oil-and-steam engines. The Still design of engine has been described and illustrated in MOTORSHIP several times, the particular application of the system as being made by the Scott company being described and pictured in our issue of April, 1921, on pages 296 and 297. This was a single cylinder unit 22" by 36" of 350 shaft h.p. at 120 to 130 r.p.m.

It will be remembered that the main source of power with the Still principle is oil consumed within the cylinder for the down-stroke, operating on the two-cycle principle, while steam forms a supplementary source of power, being used for the up-stroke on the lower side of the piston. The engine is designed to reduce heat losses to a practical minimum, the primary consideration being to accomplish this in such a manner as to improve the thermal conditions of the working-cylinders and so insure the maximum efficiency from the fuel burnt therein. The engine is enclosed and is provided with forced-lubrication to all its bearings, the necessary doors being provided for ready access to the crank-case when required. Securing the combustion cylinder is by means of four through-bolts attached to the columns.

Special provision is made in the design of the structure for expansion and contraction due to heat. The boiler, which forms an integral part of the engine equipment, is arranged at such a height that the water level is above the top of the main cylinder-jacket. A large diameter lagged pipe conveys the exhaust-gases from the engine to the boiler, which in this instance serves the purpose of a re-generator. After passing through the boiler these gases proceed to the feed-water heater, and from this the gases pass up the stack. Scavenging-air to the cylinder is supplied by a Reavell turbo-blower. Air passes from the bedplate, and is taken up the columns to the cylinder. When the main engine is started, the oil-burner on the boiler is shut-off and the boiler then serves the purpose merely of a steam and water reservoir. The combustion-cylinder jacket and the jacket surrounding the exhaust-pipe are in circuit with this boiler. The cooling-water, therefore, enters and leaves the cylinder-jacket at a constant temperature regulated by the pressure of the steam. During combustion and expansion heat is taken up by the water circulating in the cylinder-jacket, all of which goes to form steam, and steam is also produced by heat recovered from the exhaust-gases through the medium of the re-generator or boiler (which may be designed to serve this purpose), and the feed-water heater. Steam generation from these sources when the engine is under way, performs useful work on the steam side of the main-engine piston, and may be also employed for auxiliary purposes.

During compression, owing to the cylinder-walls being at steam temperature, the air charge picks up heat, instead of losing during the greater portion of the stroke, which is claimed to be an advantage of the greatest value to the Still engine. One result of this is that the compression pressure is considerably less than in the true type of Diesel engine. This enables lighter scantlings to be used, or alternatively provides a larger margin of safety, as the maximum pressure possible in the cylinder is a function of the compression-pressure. The compression-pressure is about 300 lbs. per sq. inch.

As previously indicated obviously a new term will be required for a merchant ship fitted with this combination oil and steam engine, so we again suggest a name that hitherto often has been erroneously used for Diesel-driven vessels, namely — "motor-steamer."

Porting and Charging of Two-Stroke-Cycle Oil-Engines

Paper Read Before the American Society of Mechanical Engineers, New York, Dec. 5-9, 1921, by Louis Illmer

This paper deals primarily with single-acting surface-ignition engines having the lower portion of the cylinder-bore provided with intake and exhaust-ports successively uncovered by the piston as it approaches the end of its expansion-stroke, pre-compressing the air-supply and charging the power-cylinder. Piston-controlled ports in the two-cycle engine eliminate the need of mechanically operated inlet and exhaust-valves, the products of combustion being swept out by a fresh charge of air. In case this charge is not properly deflected and spread out the incoming air, says the author, tends to head directly toward the open exhaust-port without displacing the gases.

The average pressure-head required to inject the air-charge into the power-cylinder depends upon the volume of pre-compressed air delivered to the intake port from the base-chamber, the average inlet-port area exposed by the piston during the base delivery-period, and the time available for introducing the charge into the power-cylinder. The intake-port should not open until the exhaust back-pressure has dropped to about equal to the maximum-pressure in the base-chamber. The amount of free-air actually discharged from the base-chamber of a non-scavenging two-stroke-cycle motor may be conservatively placed at 0.8 the piston-displacement in cubic inches. In the non-scavenging engine the counter-pressure that must be overcome by the incoming charge is partly fixed by the rapidity with which the exhaust-pressure equalizes with the atmosphere. In the scavenging-engine it is advisable to prolong the pressure-head behind the piston-controlled inlet-port to a greater extent than is customary in a non-scavenging engine. A relatively large volume of fresh-air should be charged into a two-stroke-cycle cylinder and this air should be trapped and held behind the piston at the instant of exhaust-closure. This is effected by spreading the incoming air-charge over a large portion of the cylinder-area, diverting the flow of the incoming-charge into the upper-part of the cylinder-bore by means of a properly formed baffle-plate.

WHAT TO DO WITH THE "SCRAPPED" NAVIES

The old German battleship "Odin," now a Diesel-driven cargo motorship, loaded with locomotives en route for Russia

Injection and Combustion of Fuel-Oil

(*Continued from page 34, Jan., 1922, issue*)

Experiments With Solid-Injection and Air-Blast in Marine Diesel Engines

By ENGINEER-COMMANDER C. J. HAWKES

Part VIII.

It has been mentioned that when working at high mean-pressures an increase in the quantity of fuel injected, other conditions remaining the same, tended to decrease detonation. In this instance it is probable that the additional fuel injected resulted in the formation of pockets too rich in fuel, and that combustion was consequently delayed.

Although many experiments were carried out it has not so far been possible to run at high powers with Texas fuel-oil at comparatively low fuel-consumptions and at the same time avoid the detonation effect entirely. Generally speaking a reduction in the intensity of detonation resulted in increased fuel consumptions. It is probable, however, that better results may be obtained by further modifications to the fuel valves and cams.

Detonation is not very noticeable in the laboratory 20 inches by 20 inches air-injection, four-stroke cycle, single-cylinder experimental engine when using Texas fuel-oil and running at high mean-pressures at about 300 R. P. M. It would appear, therefore, that the type of engine has some influence on the intensity of detonation. As, however, the maximum pressures were approximately the same in the four-stroke engine and in the two-stroke opposed-piston engine it would seem to point to temperature as being one of the factors on which detonation depends, and not pressure.

So far as is known the spontaneous ignition-temperatures of fuel-oils have been determined hitherto, in either air or oxygen, at atmospheric pressure, by allowing drops of the fuel-oil to be tested to fall on to a heated porcelain crucible cover on into a platinum crucible, and noting the temperature at which the oil drops burst into flames. Although the results thus obtained are of value, and no doubt can be regarded as the true ignition temperatures of the fuel-oil tested, within the limits of accuracy of the apparatus used, it was felt that so far as Diesel-engines were concerned these ignition temperatures could not be used directly for determining the compression ratio necessary to ensure the ignition of a fuel-oil, when injected into an engine started from the cold condition. The method of injection and the quality of the fuel-spray obtaining in the Diesel-engine are not taken into account in these tests and the " time element " is for all practical purposes disregarded altogether.

When fuel-oil is injected into an oil-engine of the Diesel type the temperature at the end of compression necessary to ensure spontaneous ignition depends on the oil used, on the quality of the spray (*i. e.*, the degree of pulverization of the oil, which affects the speed of vaporization preceding ignition), on the method of spraying the oil, and on the proximity of the spray to the water-cooled cylinder cover. Having these points in view, therefore, it was decided to design a piece of apparatus with the object of ascertaining what might be termed the *practical* ignition temperatures of fuel-oils under conditions which approximate as closely as possible to the actual conditions obtaining in an engine. Knowing the practical ignition temperature of a fuel-oil it was hoped that the lowest compression ratio necessary to ensure the ignition of the fuel in an engine, when starting from the cold condition, would be readily obtained from a temperature-compression curve.

A section through the cylinder and a diagrammatic arrangement of the apparatus is shown in Fig. 24. It will be seen that the apparatus consists of a steel cylinder A fitted at one end with a water-cooled cover B in which the fuel valve is situated. This cover is also fitted with compressed air and gauge connections C and D. At the other end of the cylinder a steel-plate cover E, not water-cooled, is provided, which is held in position by the ring nut F and set screws. The cover E is fitted with a relief-valve and indicator connection G and a heat-insulated sheath H which carries the thermocouple J. Provision was originally made for a fan to circulate the air in the cylinder and thus obtain a more uniform temperature before the injection of the fuel-oil, but so far it has not been found of any great value.

The steel cylinder, which is 5 inches internal diameter and 10½ inches long, is fitted into a Brayshaw gas-furnace, so that the compressed-air contained in the cylinder can be brought to any desired temperature. When the cylinder is heated the temperature of the shell is slightly higher than the temperature of the air it contains, and in this respect, therefore, it differs from the water-cooled cylinder-liner of an engine. The diameter was, however, fixed at 5 inches so as to ensure that with the fuel-sprayer used the spray would not strike the heated shell.

It was intended that both the solid and the air-injection systems should be tested and the fuel valve L was designed wih this purpose in view. The fuel-valve was, however, at first arranged for the solid-injection system and, as it was desirable that the quantity of fuel-oil injected should only be sufficient to ensure an appreciable rise in pressure after combustion, the sprayer was provided with *one* hole 0.013 inch in diameter. The fuel-valve is operated by means of a falling weight W, released by a lever (not shown in the figure), which, after falling through a distance of about one foot, strikes the washer Y secured to a rod attached to the valve lever M. The fuel system is charged to the pressure required by means of a small hand pump placed near the apparatus.

To ascertain the distribution of the fuel-oil with the 0.013" hole sprayer a wooden plug, covered with white paper, was placed in the cylinder so that its surface was at right angles to the axis of the cylinder. The cylinder was then filled with compressed-air to a pressure of 400 lbs. per square inch at atmospheric temperature, and when a charge of fuel-oil was injected the distribution was found approximately from the diameter of the stain on the paper. By placing the plug in various positions, and injecting a charge of oil for each position, the distribution throughout the length of the cylinder was readily ascertained. It was found that when the plug was placed

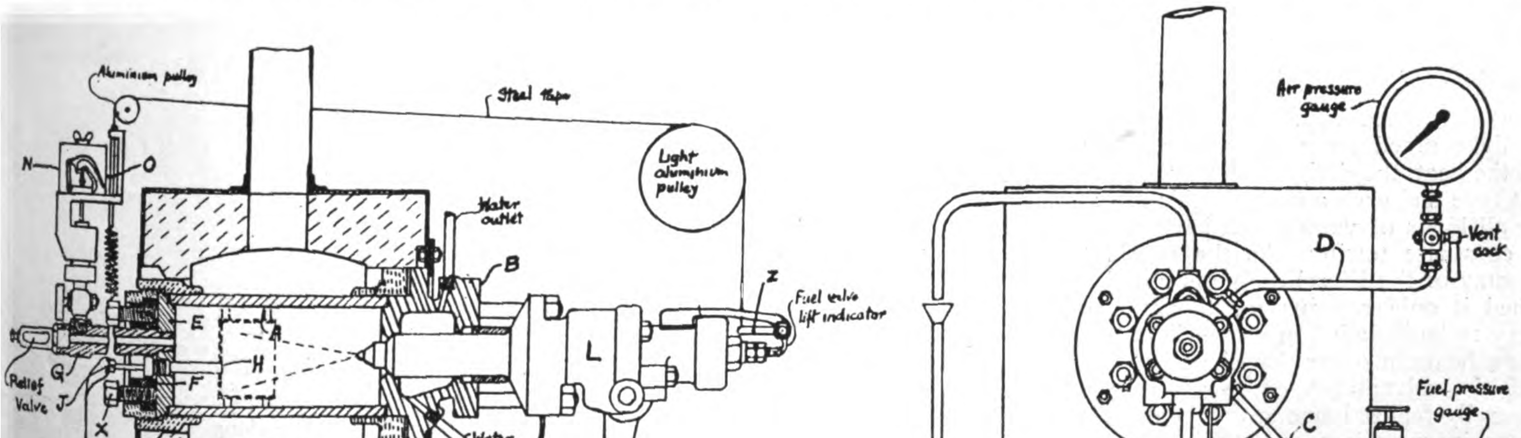


Figure 24

hard up against the cover E the paper was not completely covered with fuel-oil, which indicated that little or no oil was striking the sides of the cylinder. In order that a false reading should not be obtained, however, by a portion of the spray striking the cylinder a sheet-iron cup surrounded by an air space was fitted at a later date, as shown dotted in Fig. 24. The base of the cup was placed at the point of maximum temperature in the cylinder, *i. e.*, about 3 inches from the end, and the thermocouple sheath pased through the base of the cup. It was found that the fitting of the cup made no appreciable difference in the results obtained, but it was thought desirable to retain it.

The cylinder is charged with compressed air from the Laboratory air main and heated up to the required temperature. When the charge of fuel-oil is injected into the cylinder and ignition has taken place, which is indicated by a rise in pressure and also by a slight rise in the temperature of the air, the cylinder is cleared out by relieving the pressure through the vent cock and blowing through with compressed air.

In addition to the ordinary indicator for recording pressure rise a separate pencil attachment O is fitted, which is constrained to move vertically. This attachment is actuated by means of a steel tape 0.006 inch in thickness, which is connected to one arm of the bell-crank lever Z (Fig. 24), the other arm of the lever pressing against the end of the fuel-valve spindle. The movement of the fuel-valve spindle is therefore transmitted to the pencil and a valve-lift diagram is drawn on the paper carried by the continuous recorder N. A spring pulls the pencil attachment down when the fuel valve is closing, but it is only the instant of the opening of the valve which it is desired to record. The valve-lift pencil O is placed vertically above the ordinary indicator pencil, and valve-lift and pressure diagrams are recorded on the same card.

The indicator is placed about 8 inches from the cylinder cover to protect the spring from the heat of the furnace. The piston and cylinder of the indicator, as in the case of the indicators used with the experimental engines, are thoroughly cleaned after each test. It was found that the speed of the paper of the ordinary rotary recorder was insufficient and a new indicator was obtained, giving a paper speed of 20 inches per second. Several timing devices were tried but that now in use consists of a trembler coil, to which a pencil is attached, operated by a battery through a commutator driven by a constant-speed clock mechanism.

The temperature of the air in the cylinder is measured by a base-metal thermocouple J and an indicator R. The hot junction of the couple was made by brazing together the ends of "nichrome" and "ferry" metal wires. The cold-junction ends of the wires were fitted into glass tubes closed at one end and placed in water in a vacuum-flask. The hot junction is placed in contact with the end of the sheath H which is insulated from the cover with asbestos washers, etc. It takes an appreciable time to adjust the temperature of the air to that required for the experiment, and it is considered that the temperature of the end of the sheath, which is made as thin as possible, can, for all practical purposes, be taken as the temperature of the air in its vicinity.

(*To be continued*)

NEW CANADIAN DIESEL-ENGINED TUG

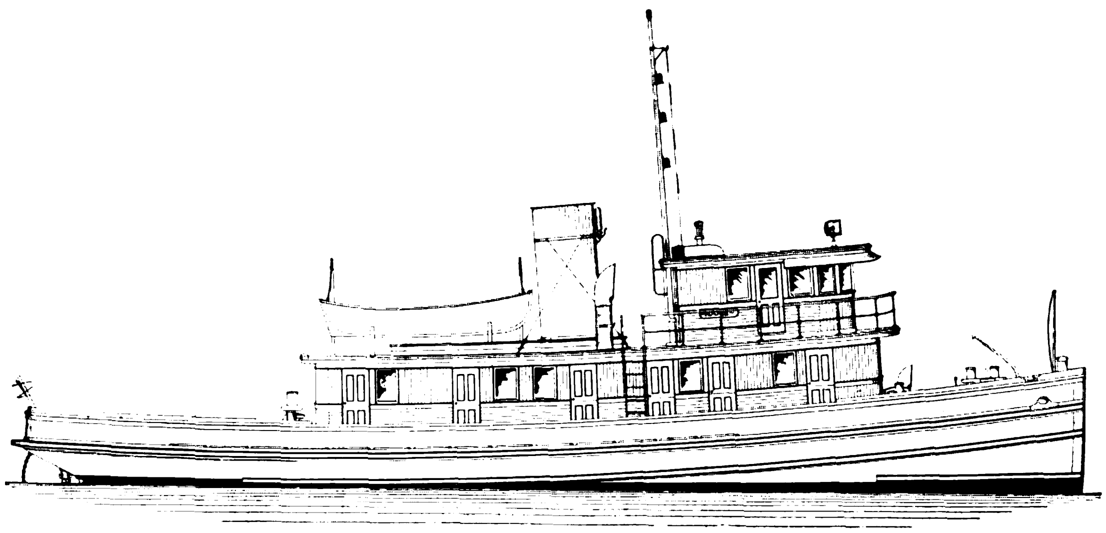
Interesting Winton Installation

THE Abitibi Power & Paper Co., Ltd., of Montreal, Canada, who operate a large paper-mill at Iroquois Falls, Ontario, have recently commissioned Ralph E. Winslow of Atlantic, Mass., to design them a new motor towboat to replace two steam towboats they now operate. This new tug is to tow booms of logs for pulpwood from Couchiching Falls to Twin Falls on the Abitibi River, Canada. These booms, containing about 3,500 cords of wood, are towed about 25 miles, the tug making one round-trip each 24 hours; therefore, two crews are required and accommodation for these men, as well as for extra raft-men and company-officials, are provided, although such a tug could be operated by four men. As there is no limit on draft this has been made sufficient to immerse an efficient propeller, which is a Columbian bronze wheel of 6 ft. 6 in. diameter. The principal dimensions of this new tug, which is to have a Winton four-cycle Diesel-engine, are as follows:

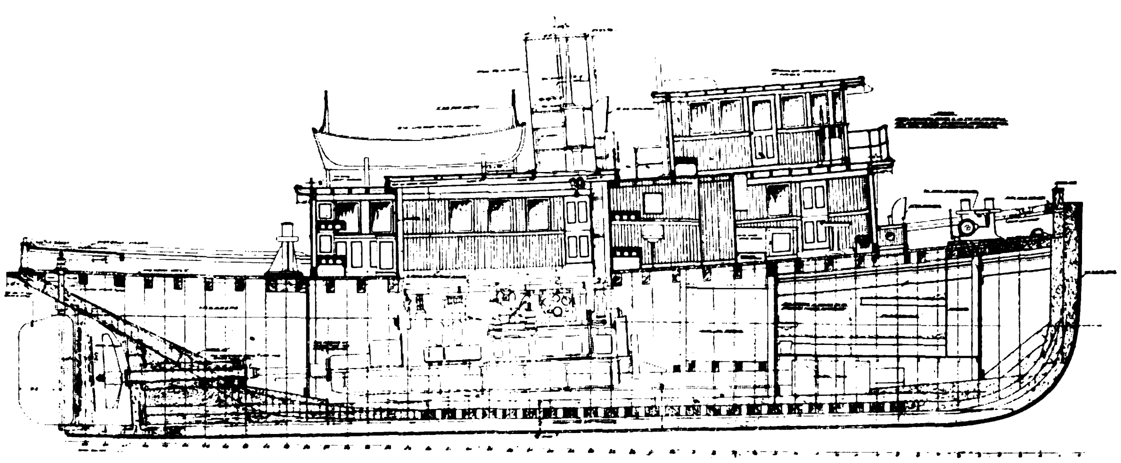
Length, O.A.	83 ft. 0 in.
Length, W.L.	77 ft. 4 in.
Breadth	20 ft. 0 in.
Draft, extreme	9 ft. 6 in.
Power	300 shaft h.p.

As will be noted from the accompanying plans of the boat, the design follows the usual tow-boat type and such a craft as this is suitable for all kinds of work about harbors, for bay or coastwise towing. As the reliability and economy of the Diesel-engine is now well established it only remains for this type of machinery to be installed in a sufficient number of tow-boats in order that the compelling force of the advantages of this power be very generally realized among tow-boat men.

The machinery equipment of this tug is quite complete, consisting of a direct-reversible six-cylinder 12 15-16" by 18" Winton Diesel-engine developing 300 brake h.p. at 210 R.P.M., one Winton auxiliary air-compressor with 12 h.p. motor, an Exeter bronze fuel-oil transfer and service-pump with 1 h.p. motor, Exeter fire, bilge and general-service pump with 5 h.p. motor, a 10 kw. Crocker-Wheeler electric-generator driven by 15 h.p. Frisbie engine, also a 25-cell 32-volt Edison storage-battery, slate switchboard and 14-in. Lebby low-voltage searchlight The usual starting-air bottle, lubricating-oil tanks, work-bench, etc., are installed. The exhaust is in the stack; a large hatch is fitted over the engine as well as a one-ton trolley.



Outboard profile of Diesel-tug for Abitibi Power & Paper Co. designed by R. F. Winslow



Inboard profile of Winton Diesel-driven Diesel-tug

The hull is being constructed by Robert J. Morrill of Collingswood, Ont., under the supervision of the designer, the machinery being installed under the direction of a representative of the Winton Engine Co. Scantlings are in excess of Lloyd's requirements, the keel, frames, stem, stern, frame, etc., of white oak, planking, clamps, shelf, etc., of yellow pine, ceiling and decks of Oregon pine. There are three watertight bulkheads. The fuel-tanks hold 4,200 gallons. Accommodations are provided for 12 men, six in forecastle, two in engineers' stateroom, two in captain's room, two in company officials' room, in addition to the usual mess room, galley, store rooms, etc.

POWER OF THE MOTORSHIP "HAURAKI"

In our November issue it was stated that the indicated H.P. of the "Hauraki" was 1750 whereas this actually was the brake H.P., so that this vessel has the same power as the motorship "Domala" of the British India Steam Navigation Company.

ANOTHER ENGLISH MOTOR-COASTER

The new auxiliary schooner-rigged coaster "Invermore," equipped with 100 h.p. Invincible surface-ignition oil-engine went into commission in November at Arklow, England. She was built by John Tyrrell & Sons, and is 100 ft. long, 22 ft. 6 in. 11 ft. draft and 300 tons deadweight capacity.

Operation of Four Italian Two-Cycle Engined Motorships

Three of These Ansaldo-San-Giorgio Equipped Vessels Have Covered Nearly 200,000 Miles in 20,200 Hours

Recent trials of an American motorship propelled by Ansaldo-San-Giorgio trunk-piston Diesel-engines in conjunction with electric-drive, produces special interest in the performances of four Italian motorships equipped with slow-speed, crosshead direct-drive Diesel-engines of the same make. It will be remembered that we made a short voyage in American waters on one of these motorships, namely the "Ansaldo San Giorgio I" and an illustrated story of this trip appeared in our issue of October, 1920, together with comparisons with a sister turbine-driven steamer.

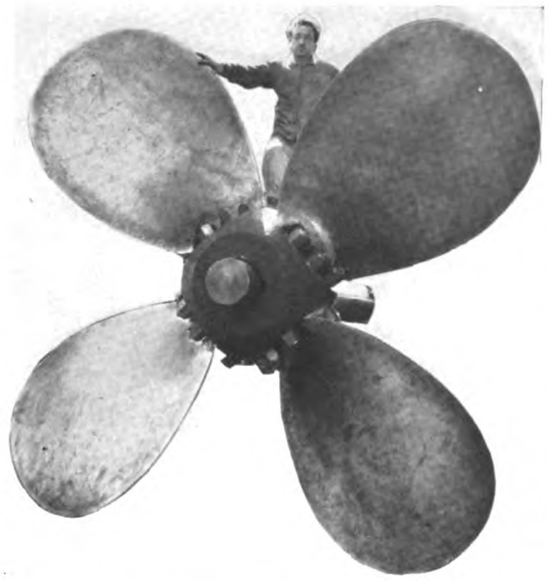
Altogether four direct-driven motorships have been completed and put in operation by "Ansaldo San Giorgio" shipyards at Muggiano, Spezia, Italy, and three more will be placed in service during 1922. These motorships of large tonnage are propelled by two "Ansaldo San Giorgio" 1,200 B.H.P. two-cycle Diesel-engines, each to 100 R.P.M.

The completed motorships are the following:

"Ansaldo San Giorgio I," "Ansaldo San Giorgio II," "Ansaldo San Giorgio III," owned by Societa Nazionale di Navigazione, Genoa, Italy; "Vejo," owned by Societa Navigazione "Roma," Rome, Italy.

As known to our readers the "Ansaldo San Giorgio" standard motorships have a displacement of 11,200 tons with a corresponding deadweight capacity of 8,100 tons, on the following leading dimensions: length, 377 ft.; breadth, 51 ft.; draft, 24 ft.; depth, 38 ft. The propelling machinery is arranged astern. The main engines are two of the "Ansaldo San Giorgio" standard type, two-cycle Diesel system, with four single-acting working cylinders, developing 1,200 B.H.P. at 100 R.P.M. The auxiliaries for main engines and general ship-service are driven by steam produced by a oil-fired "donkey-boiler." It is interesting to note that, during the sea-running, the main engines provide all the power for the ship's auxiliary service, including lights and steering-gear control.

The "Ansaldo San Giorgio I" was put in service in April, 1919. Up to recently the voyages accomplished by this craft are as follows:



One of the Bronze propellers of the motorship "Vejo"

Route.	Nautical-Miles.
Genoa—Glasgow—Genoa	= 4,800
Genoa—Valparaiso—Genoa	= 18,000
Genoa—New York—Genoa	= 9,500
Genoa—Valparaiso—Galveston—Genoa	= 19,560
Genoa—Buenos Aires—Genoa	= 13,100
Genoa—Buenos Aires (is now returning)	= 6,500

This gives a total of over 70,000 miles and 7,500 hours with her main engines working, and 95 harbors touched.

The "Ansaldo San Giorgio II" began her voyages in October, 1919, and has accomplished the following runs:

Route.	Nautical-Miles.
Genoa—Valparaiso—Genoa	= 18,000
" " "	= 18,000
" " "	= 18,000
Genoa—Valparaiso—Galveston—Genoa	= 19,560
Genoa—Calcutta	= 5,700

or a total of over 80,000 miles and 8,700 hours with her main engines in operation and 150 harbors touched.

The "Ansaldo San Giorgio III" entered service in February, 1920, and the following trips have been accomplished:

Route.	Nautical-Miles.
Genoa—Valparaiso—Genoa	= 18,000
Genoa—New York—Genoa	= 9,500
Genoa—Valparaiso	= 9,000

or a total of nearly 37,000 miles, and with 4,000 operating-hours for her main engines, with 62 harbors touched.

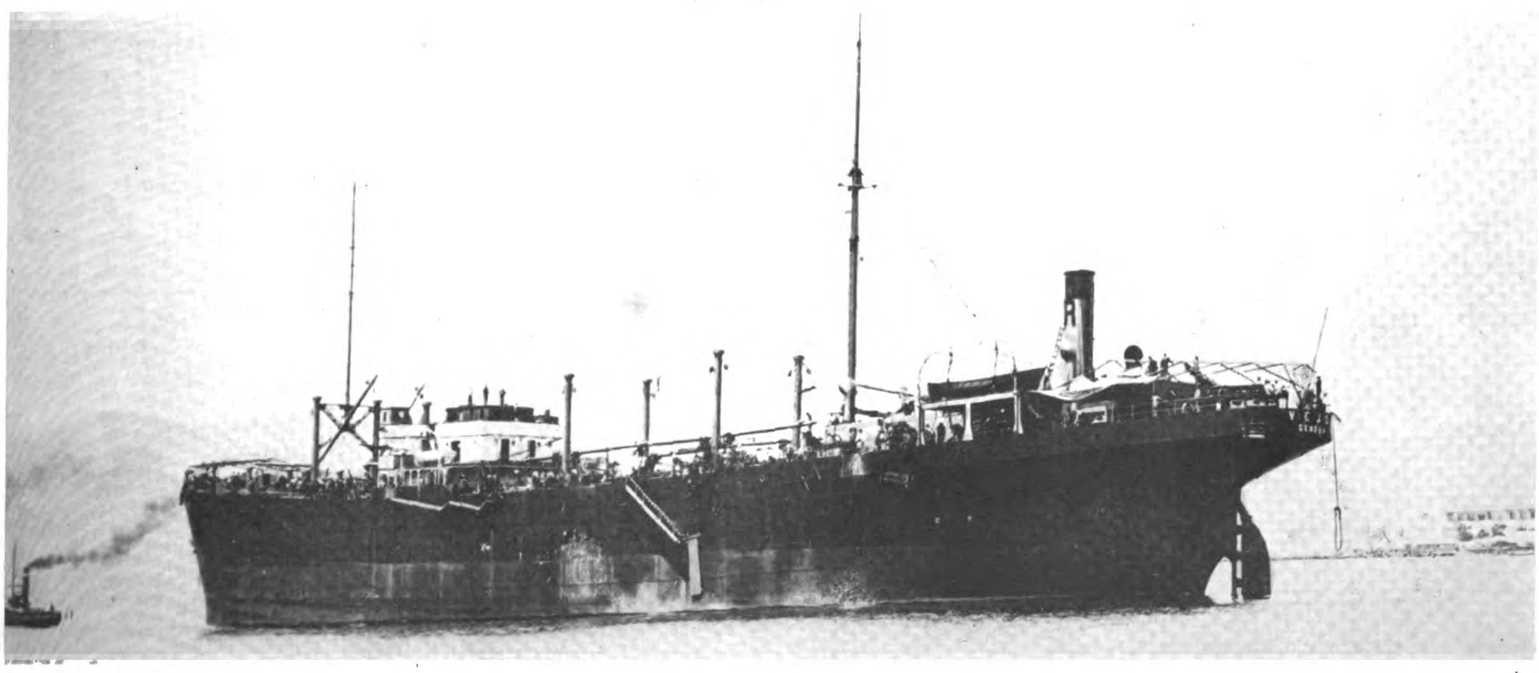
During the year 1920, this latter ship was nearly eight months in repair yard, owing to a fire that developed in her central hold due to spontaneous-combustion of the saltpetre forming her cargo. The fire caused heavy damage to the hull, at the end of the first trip, but did not damage the engines.

In aggregate the motorships built at the "Ansaldo San Giorgio" Shipyards with Ansaldo San Giorgio Diesel engines, have covered nearly 200,000 nautical-miles, with a continuous engine-running of 21,000 hours.

On sea-trials, the three "Ansaldo San Giorgio" motorships averaged a speed of about 12 knots, each engine developing 1,400 shaft B.H.P. For normal running, with a light cargo, the speed is of 10 to 11 knots, and 9 to 10 knots with a full cargo. These speeds are obtained with a daily fuel-oil consumption of 9.4 tons, a noteworthy low figure when we consider that this includes the fuel for the auxiliaries at sea.

During the most recent voyage from Genoa to Valparaiso, and return to Genoa via Galveston, Texas, the "Ansaldo San Giorgio I" and "Ansaldo San Giorgio II" have had respectively a consumption of 761 and 816 tons of fuel for distances of 19,100 and 19,560 nautical miles respectively. In other words a daily consumption of 9.3 to 9.46 tons of oil, with an average speed of 9.85 and 9.65 knots.

The "Ansaldo San Giorgio III" accomplished the last voyage to New York to Wilmington and return in 1,090 hours, on a consumption of 429 tons, or a consumption of 9.45 tons per day, averaging a speed of 9.7 knots.

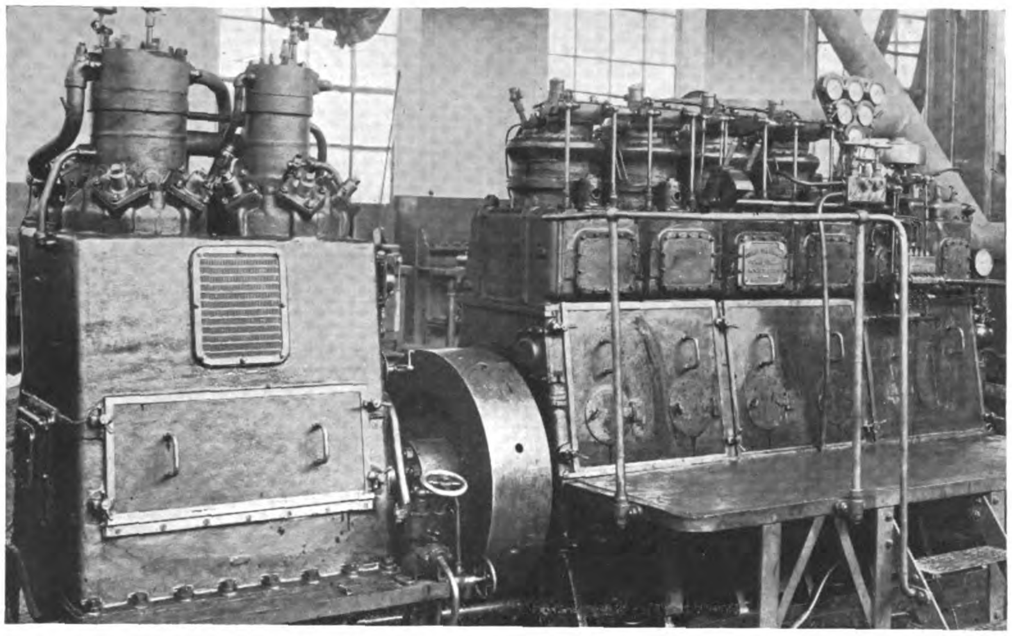


The 8,100 tons Diesel motorship "Vejo," built and engined by Ansaldo-San Giorgio, Ltd., for the Roma Navigation Company

In all voyages the unitary consumption of fuel in accordance with the power effectively developed, is 190 gr. per shaft H.P. hour, or 0.419 lb. per shaft H.P. hour, indicating that the fuel-consumption in the "Ansaldo San Giorgio" two-cycle engines is in no sense inferior to that of the leading four-cycle engines.

The operation of the engines was in every occasion as good as could be desired. The reliability and rapidity of manoeuvering has completely satisfied the request of most exigent captains and pilots. One of the reasons for which the "Ansaldo San Giorgio" motorships have been specially placed by the Societá Nazionale di Navigazione on the Chilian route, is the advantage of having the propelling apparatus always ready for any order from the navigating officer. Mooring off open coasts subject to greatest and sudden weather and sea changes, necessitates such a feature.

During the working at sea the overhauling required by the Diesel engines is practically nothing, and two men in the engine-room on watch are generally sufficient.



Ansaldo-San Giorgio four-cylinder Diesel-driven auxiliary air-compressor of the motorship "Vejo"

COOKING BY ELECTRICITY ON BOARD SHIP

In about one out of every five motorships built today cooking and heating are carried out by electricity, advantage being taken of the Diesel-electric generating-sets in the engine-room to obtain economical current. A Diesel vessel of 7,000 to 10,000 tons is generally equipped with three sets of 75 to 150 k.w., one being a stand-by. With two of three sets constantly in operation, the fuel-consumption is only from ¾ to 1½ tons a day, this supplying the entire power for all the ship's auxiliaries, steering-gear, lighting, etc., as well as the winches when in port. Generally only one set is required at sea, according to the amount of current needed, so at no time can electric cooking and heating be expensive, as it would be on a steamer. Electricity is particularly advisable for a tanker.

We are enabled to give some figures regarding the electric current consumption secured by the A/S Vesta in connection with the electric-galley equipment installed by them on a motorship of 4,500 tons d.w. that has a crew of 32 persons.

The maximum current-consumption is for the day, when rye bread and rolls are made:

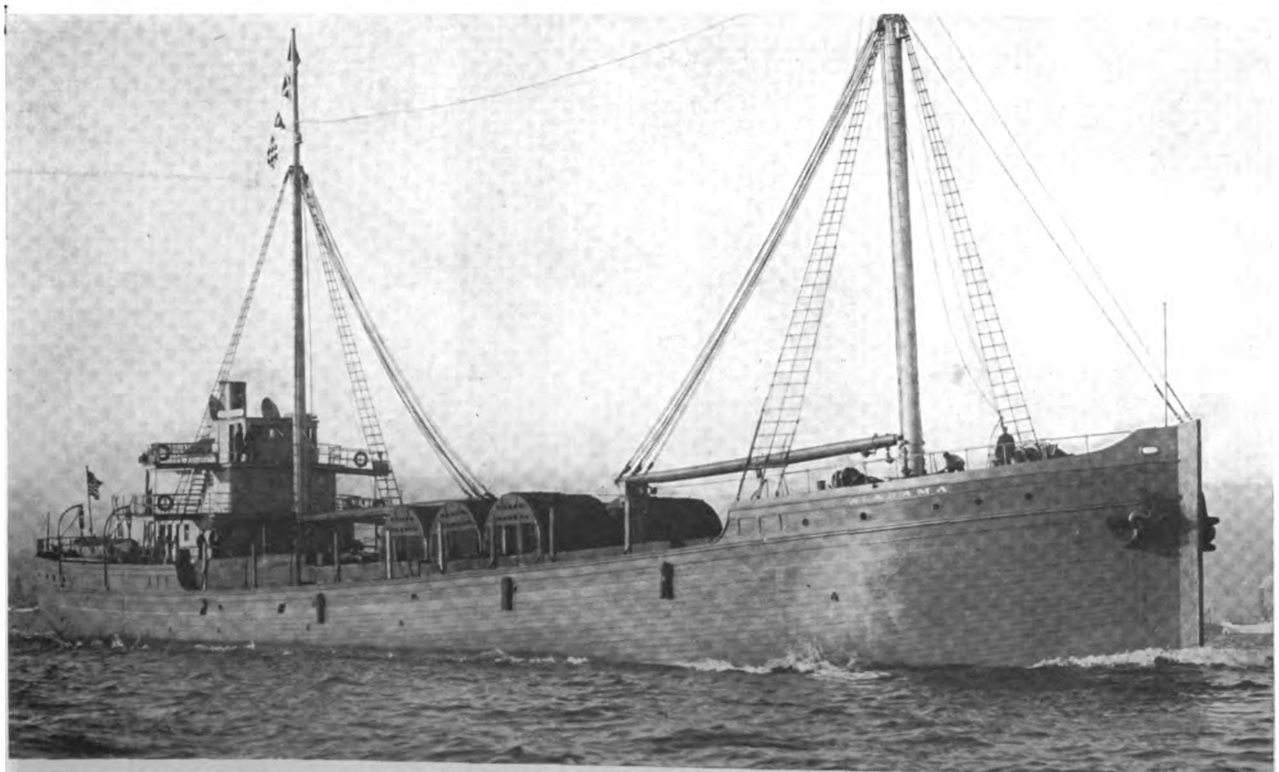
		ampere hours
From 6 a.m. to 9 a.m.	morning—coffee, current-consumption.....	15
From 9 a.m. to 12 a.m.	lunch and dinner, current-consumption..	35
From 12 noon to 3 p.m.	afternoon meal, and bread and rolls are made, current-consumption	50
From 3 p.m. to 6 p.m.	evening meal, current-consumtion......	20
From 6 p.m. to 6 a.m.	heating of 150 litres of water in the hot water accumulator and cooking of coffee for the night watch, current-consumption..	14
	Total	134

This is the maximum current-consumption per day-and-night the day that bread and rolls are made, as the ship's consumption of bread and rolls are made on board. This means an average of 11 b.h.p. If the consumption of fuel-oil per H.P. is 10 grams. and cost of the oil 80 Danish Kroner per ton, the total consumption is 40 kilos of oil at 8 Ore per kilo, or 3.20 Danish Kroner which, on board a motorship with a crew of 32 people, will be ten Ore per person per day, when the maximum current-consumption is taken into consideration. The average consumption for the period of a week is only 7 Ore per person per day. (100 Ore = 1 Kroner, and normally a Kroner equals 26.8 cents, the exchange rate today being about 20 cents per Kroner.)

The costs for the repair of an electric-galley equipment for 32 persons as to heating elements and spare fittings for last year with an equipment delivered in 1919 was 42.70 Kr., or 1.17 Kr. per day and night. The ship was in continuous service and frequently visited New York. The total working expenses for the use of an electric galley-equipment is thus very favorable, viz., 10.7 Ore per person per day-and-night on an average. A voltage of 220 is used.

SIGNALLING DEVICES FOR MOTORSHIPS

At the completion of one of the recent trials of a large motorship the steam-tug which came alongside to take off the guests gave several toots of her deep-toned steam whistle in salute, these being replied to by the motorship's air whistle. This latter device gave several shrill squeaks which actually brought laughter from those who heard it; consequently her owners quickly installed an adequate siren. Proper and commanding signal devices are necessary for safety. The American Strombos Company has developed an air-siren which it is claimed can be heard at great distances although its sound is agreeable to the ear, long and short blasts may be given, the tone is deep, resembling that of air-raid signals. Steam is not available on motorships except on motor oil-tankers, and in these craft the supply is not always sufficient to blow a large siren. Therefore, this new device utilizing air in small quantities will appeal to shipowners, especially as this small quantity at moderate pressure produces a blast loud enough to command attention. It was originally developed for air-raid warning in Europe.



Another successful wooden motorship—the "Isle de Java"; also a McIntosh & Seymour Diesel-engined war-time built vessel

Trials of Fruit-Carrying Motorship "Pinzon"

Fuel-Costs Only 13 Cents Per 1000 Ton-Miles—A Speed of 12½ Knots Attained

Last month we described and illustrated the Beardmore-Tosi Diesel engine of the MacAndrews fruit-carrying single-screw motorship "Pinzon," 2,050 tons dwc. This vessel has just run trials on the Clyde. She has been designed for carrying fruit between Spanish, Portuguese, and United Kingdom ports. She has no boilers whatever, so that the fruit carried will not suffer any deterioration owing to heat radiation or the presence of steam or steam pipes.

The trials extended over three days, the vessel making a series of eight progressive runs over the measured mile, working up to a speed of 12½ knots fully loaded, and afterwards carried out thoroughly successful reversing and manoeuvring trials, the machinery installation working with the most perfect smoothness.

In the course of the trials it was found that for a speed of 9 knots, fully laden, the revolutions of the main engines were 95, that at 105 r.p.m. the speed was 10 knots, and at 115 r.p.m. the speed was 11 knots. At 9 knots speed the fuel-consumption was at the rate of three tons per day, at 10 knots it was four tons per day, and at 11 knots it was 5.2 tons per day.

Costs of operation during the tests should greatly interest American fruit-carrying companies, especially as all of them at present exclusively operate uneconomical steam-driven craft.

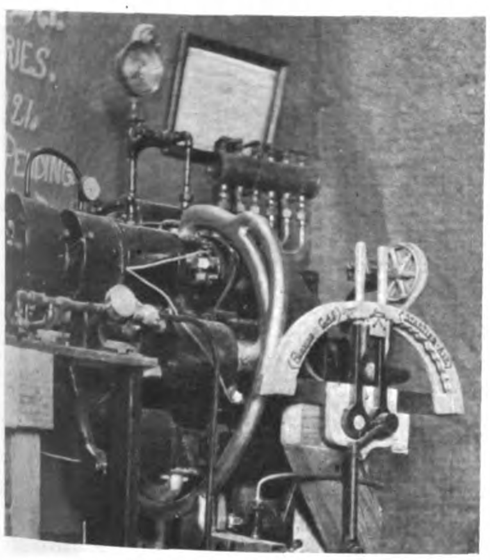
At the lowest of the three speeds the cost of fuel per hour (at £4 per ton) was 10s, at the second speed it was 13s. 4d. and at the highest, or service, speed it was 17s. 4d. For the day of 24 hours the costs at the three speeds were £12, £16, and £20 8s. respectively. It was also shown the fuel costs per 1,000 ton miles were 6½d. (13 cents) at 9 knots speed, 7¾d. at 10 knots, and 9¼d. at 11 knots, and that the cost of lubricating-oil for all purposes averaged one-sixteenth of the fuel cost.

With the cost of oil fuel lower in America, additional benefits should accrue to shipowners in this country.

NEW AMERICAN GASOLINE TURBINE

Initial experiments of the development of an oil-turbine for motorships have recently been carried-out at Morton, Delaware County, Pa., by Otto Kories, a Diesel engineer employed at the Cramp shipyard, Philadelphia. The first unit has just run tests, but has been constructed under difficulties and not with the best of material due to the limited financial resources of the inventor. This is a small gasoline-turbine which later will be designed to run on heavy-oil. Early in February the first run was made. This lasted 15 mins. at 800 r.p.m., followed by 15 mins. at 1,000 r.p.m., 15 mins. at 1,200 r.p.m., 15 mins. at 1,500 r.p.m., all without load.

Then the engine was put on load and the speed reduced to 1,160 r.p.m., which showed the best results, ignition-air being at 102 lbs. It was connected to a 55-volt generator, which was operated at 232 amperes with ease, and



Gas turbine developed by Otto Kories

the turbine run for one hour. It was then stopped and started several times with success. Afterward the turbine was dismantled and inspected, but no faults were found, only a few blades showing signs of having received a full blast of fire. About ¼ pint of lubricating-oil was used for the bearings and two cams. Less than two quarts of gasoline was consumed on the entire run of 2 hours. The power output at full load was 17.1 b.h.p. For the one hour run at full load 1¼ quarts of gasoline, or 2.8 lbs., was used.

As the results of this run several minor changes are being made to the design. The compressor is of the two-stage rotary type, which compresses its air against the housing to 68 lbs. at 1,000 r.p.m., 87 lbs. at 1,200 r.p.m. and 111 lbs. at 1,500 r.p.m. The inside diameter of the combustion-chamber is 3" by 1" width, the chamber being water jacketted. Piston-type valves, operated by cams, one of the latter serving two valves, are fitted, the valves being drilled horizontally through the center.

The operation is as follows: By slightly opening the gas lever and opening the starting-valve "full," air enters the turbine wheel, setting it in motion. At the same time the compressor blows the compressed-air thru a specially designed atomizer, the mixture passing thru the gas-intake manifold to the combustion-chamber via the mechanically operated valves. The valves then close the moment that combustion occurs, and the gases escape thru ports and on to the turbine blades.

NEW 1,000 TON BOLINDER-ENGINED TANKER

Now completing at the Rotterdam Dry Dock Company's plant for the Asiastic Petroleum Company of London, is a steel motor-tanker of 1,095 tons d.w., for their Yangtse River service in China. She is of the shallow-draft type drawing 9' 3" of water. In this vessel three Bolinder oil-engines of 320 shaft h.p. each will be installed. Construction of the hull is on the transverse system.

NEW FLEET OF TANKERS

"Phero," the fifth of the 500-ton motor-tankers built to the order of the Anglo-Persian Oil Company, has been completed by Crichton-Thompson Company. In each vessel a 180 b.h.p. Kromhout surface-ignition oil-engine is installed.

BIG SAILING SHIP BEING CONVERTED

Now being reconditioned in Holland is the sailing ship "Scala Shell" of 4,500 tons d.w., which is being equipped with two 800 shaft h.p. Vickers submarine-type Diesel-engines, to the order of the Anglo-Saxon Petroleum Company.

MOTORSHIP "MUNSTERLAND" IN SERVICE

The motorship "Munsterland," sister to the "Haveland" recently ran trials and started on her maiden voyage to the Far East. Both these vessels have high-powered German submarine Diesel-engines, driving propellers through reduction-gears, and are owned by the Hamburg-American Line. The "Haveland" was fully described and illustrated in Motorship.

SAYS PROFESSOR EMORY R. JOHNSON

In an address before the American Society of Civil Engineers, E. R. Johnson, Professor of Transportation and Dean of the Wharton University, Pa., stated that experts believe the most economical and efficient engines are those of the Diesel-type. It is important that shipowners should be encouraged to convert some of their steamships to Diesel-engined vessels, and that those who order vessels in the future should be able to order an increased percentage in tonnage equipped with Diesel engines.

A POSSIBLE MARKET FOR OIL-ENGINES

The United States Department of Commerce in its weekly survey "Commerce Reports" points out that in the Canton Delta, China, there is a field for oil-engines in the many launches used for towing passenger and cargo junks which form the means of conveyance for the greater part of the traffic of the Delta. The cost of gasoline and kerosene in this region is very high; the stand-by and operating costs of steam-plants is out of reason; therefore it is considered that here is an excellent potential market for oil-engines. There are now 542 registered vessels plying the inland waters of the Delta.

THREE DIESEL CANAL TUGS UNDER CONSTRUCTION

Two 67-foot and one 60-foot wood tug-boats are now under construction at the C. Hiltebrant Dry Dock Company plant, Kingston, N. Y., for the Transmarine Corporation of New York. They are building from designs by R. R. Livingston of New York. All are to be of 16 ft. molded breadth and 7 ft. 6 in. draft, but the 67 foot tugs will each be powered with a 240 h.p. Nelseco Diesel-engine while the 60-foot tug will have a 180 h.p. engine of the same make. This smaller tug will also be equipped with a Kitchen reversing rudder. They will be ready when the Canal opens in the Spring.

MARINE OIL-ENGINES IN TURKEY

According to special communication to "Motorship" from the American High Commission of the U. S. Department of Commerce at Constantinople, Turkey, during the past 24 months a number of surface-ignition oil-engines of the Bolinder and Skandia makes of 90 to 100 h.p. have been sold to the Turkish market. Also a number of oil-engines of similar power have been exported by the Italian firm of Sattima of Trieste. But there has been some little trouble in disposing of these engines owing to the average price of the Ltqs 1500 being considered too high. There are several shipyards on the Black Sea engaged solely in the construction of native "mahones" or lighters up to 200 tons which are used for general harbor work and in many cases a marine motor of 40 to 60 h.p. is installed. Some of these are sent to Constantinople for service in local waters.

Interesting Notes and News From Everywhere

NINETY PER CENT OF ORDERS WERE FOR DIESEL SHIPS

During the last six months 90 per cent. of all new orders for merchant ships placed with British shipyards, were for Diesel-driven vessels, says the "Steamship," and that the same is evidence of the deserved popularity of motor-driven ships.

PROPOSES BUILDING ANOTHER MOTOR FERRY

In service since Dec., 1919, is the Gloucester & Yorktown Ferry, and the owner, W. T. Ashe, of Gloucester Point, Va., is considering building another motor-vessel. His present craft is propelled by a 60 b.h.p. Fairbanks-Morse oil engine.

LAUNCH OF SINGLE-SCREW MOTOR-TANKER "OSSAG"

The Deutsche Werft, of Hamburg, Germany, have launched their second single-screw Diesel-driven tanker, namely the "Ossag," 4,000 tons d.w. This vessel is to the order of the Stern-Sonneborn Oil Co., and is fitted with a 1,500 I.H.P. A.E.G.—B. & W. Diesel engine.

S. A. E. ANNUAL MOTOR-BOAT MEETING

The Society of Automotive Engineers has arranged a short but an unusually interesting program for its Motor Boat Meeting to be held at the Hotel Commodore on February 21st at 10:30 A. M. A paper will be given by Elmer A. Sperry on Compound Oil-Engines for Marine Use, Commander Ernest Nibbs, formerly of the British Navy, will describe the development and building of Diesel engines, while Albert Hickman will speak on surface propulsion.

GERMANS BUILDING DIESEL-TANKER FOR ITALY

An order has been secured by the Deutsche-Werke of Kiel (not to be confused with the Deutsche Werft of Hamburg) for a twin-screw motor-tanker from Italian shipowners, in which two of the new Deutsche-Werke four-cycle Diesel engines illustrated in this issue are to be installed. A description of this four-cycle engine, which has been designed to develop 950 shaft h.p. at 135 R. P. M., was given on page 875 of our Nov., 1921, issue. General arrangement drawings were published on page 902 of the same issue.

THE NEXT MARINE EXPOSITION

The American Marine Association, formerly the Marine Equipment Association of America, has secured the Grand Central Palace for the next annual marine exposition, which will occur during the week of November 6. The Society of Naval Architects and Marine Engineers has decided to change the date of the annual convention from the week of November 13 to the week of November 6. It is quite probable that the Marine Engineers' Beneficial Association and the American Society of Marine Designers will also hold their conventions during the week of the exposition.

WARSHIPS TO MERCHANT MOTORSHIPS

As has been outlined in these pages a number of German warships have been converted to Diesel-driven merchant motorships, including the cruiser "Gefion" now named "Adolph Sommerfeld" (see page 737, March, 1921), and the destroyers H16 and H178 (see page 487, June, 1921). The present name of the H18 is "Hoisdorf." On another page is illustrated the old German battleship "Odin," now propelled by submarine-type Diesel-engines. She is shown passing through the Kiel canal with cargo of locomotives for Reval and Petrograd, where she recently delivered her cargo. She is owned by Arnold Bernstein of Hamburg.

NEW EDITION OF "OIL ENGINES"

The Fifth Edition of the "Design and Construction of Oil Engines," by A. H. Goldingham is just being published and will be ready about March 5th. Many of our readers who are conversant with the earlier editions of this well-known book will welcome the new and enlarged treatise, which has been brought up-to-date.

It is now printed in two parts, bound in one volume. Part I discusses the modern high-pressure oil-engines of both two and four cycle types, while Part II treats of the earlier designs, their history and development. This volume is now therefore thoroughly comprehensive. It includes practical and reliable information on the design and construction as well as the operation and correction of Oil Engines.

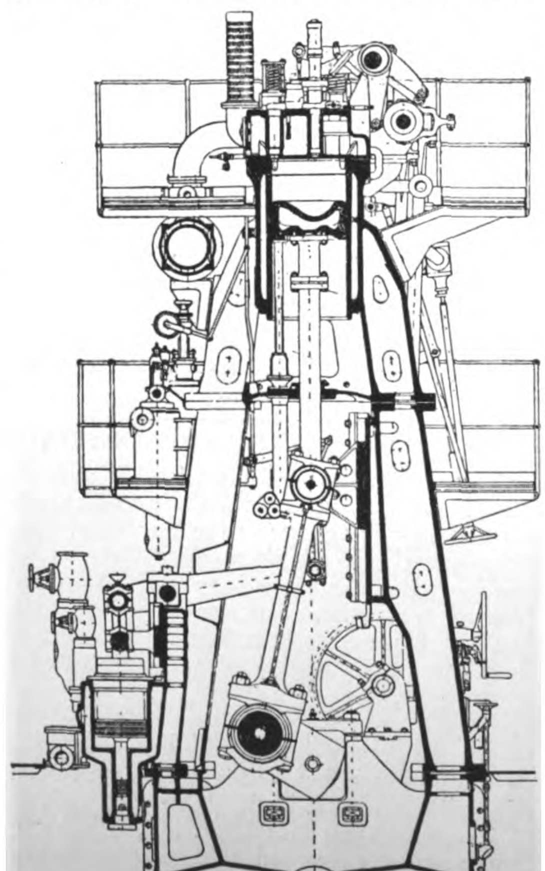
It traces the activities of this art from its inception and also sets forth the many improvements in modern designs. It includes about 200 sectional illustrations and has over 400 pages. This book is distinct from Mr. Goldingham's work on Diesel engines. Spon & Chamberlain are the publishers. Copies can be obtained from "MOTORSHIP" office, price $4 net, postage 20 cents.

NEW PACIFIC WERKSPOOR DIESEL-ENGINED TUG-BOAT

At the yard of John Martinoli of Dockton, Wash., is being constructed a tug for the Olympic Tug & Barge Co. of Seattle in which a 150 brake h.p. Pacific-Werkspoor Diesel-engine is being installed. This vessel is 71 ft. long, 17 ft. breadth and 7 ft. draft. The engine installation is being made by the Allan Cunningham Co. under the supervision of the Diesel Engineering Co. of Seattle, agents for the Pacific Diesel Engine Co. of San Francisco, who built the engine.

THREE MORE CRAFT DISCARD STEAM

Considerable activity is evident on the Pacific Coast in the installation of small Diesel-engines in work-boats. That the reliability and economy of this type of power is recognized by the operators of these boats is evident from the number of concerns now removing the steam-engines and boilers and installing Diesel-engines in their place. Two 75 h.p. Fairbanks, Morse oil-engines are replacing steam in the freighter "A. W. Starrett," owned by the Merchants Transportation Co., of Tacoma, Wash. One hundred horse-power Fairbanks, Morse oil-engines are replacing steam plants in the tug-boats "Osprey" owned by Foss Tow Boat Co. of Tacoma and "Advance," owned by the Cascade Tug Boat Co., of Seattle, Wash.



Section of the Deutsche Werke Diesel Engine illustrated on another page

WAR DEPARTMENT MOTOR-VESSEL

On page 117 of our February issue we mentioned that the U. S. War Department was having built a 71 ft. twin-screw Diesel-engined craft for the Mississippi River Commission. The builders of this vessel are John Eichleay Jr. & Co., of Pittsburgh, Pa., and the cost is $37,000.

VOYAGE OF THE "WILLIAM PENN"

Having made a non-stop run of 4,000 nautical miles from Madras, India, the Shipping Board's motorship "William Penn" arrived at Suez on Jan. 24th. Five days later she reported off Malta, when her Diesel-engines were developing 4,355 indicated horsepower (metric), or equivalent to a speed of 11.9 knots, with everything going fine. From Marseilles, she will proceed to London, then Bremen, Hamburg, Rotterdam, and possibly Liverpool, thence back to New York by about March 15th, thus completing a voyage around the world at lower operating cost than ever before made by an American ship of her tonnage. These costs when published will astound shipowners. The Barber Line are her operators.

TRIALS OF MOTOR-PASSENGER LINER "DOMALA"

After a day's trial on the measured-mile this vessel completed on Dec. 5th a continuous sea-trial of 48 hours duration at full power, when everything worked splendidly. The "Domala" is now well-known as a new passenger motorship of the British India Steam Navigation Co. and is engined by twin sets of 4-cycle North British Diesel-engines. She is 450'0" long B.P., by 58'0" moulded breadth. D.W. 10,500 tons. On trial the main draft was 19'11½", and the displacement at this draft was 11,100 tons.

Hull Block Coefficient....................0.763
Propeller ....15'0" dia. 15'6" pitch (3 bladed)
Propeller area (expanded)..............64.5 ft.
Propeller area (projected)...............54.6 ft.
Mean Speed ....13.4 knots.
Fuel-Consumption (Main engines)
36.87 tons for 48 hours.
Fuel per I.H.P. hour....................0.296 lb.
No of Cylinders of Main Engines.........8 each
Cylinder Dia. ....26½"
Piston stroke ....47"

Mean results over the 48 hours.

Engine-Speed (Port).............96.4 R.P.M.
Engine-Speed (Stbd).............96.5 R.P.M.
Mean pressures, (Port).....103.8 lbs. per sq. in.
" " (Stbd) ... 94.4 lbs. per sq. in.
Indicated horsepower (Port)............2,625
" " (Stbd)............2,417.5
" " (Total)...........5,042.5

Pressures.

Starting-air ....about 295 lbs. per sq. in.
Blast-Air .... " 985 " " " "
Cylinder cooling-water " 22.75 " " " "
Piston .... " 44.3 " " " "
Lubricating-oil ...... " 15.0 " " " "

Temperatures.

Sea Water ....about 51.6° F.
Discharge Overboard ....about 145° F.
Cylinder Cooling discharge.......about 112° F.
Piston Cooling discharge varied from
105° to 125° F.
Engine-room at Platform........65° to 78° F.
Independent Compressor I.H.P.............550
Electric Generator I.H.P...................250
Anglo-Persian Fuel-Oil used.
Spec. gravity at 16° C= 0.899.
Flash Point..........167° F.
Electric Generators (2) each driven by 6 cylinder 4-cycle Diesel 11½" dia. x 14½" stroke 250 revs.
Compressor-Sets (2) each driven by 6-cylinder 4-cycle Diesel 15" dia. by 17¾" stroke.

All the above trials and runs have been most successful and free from noise and vibration and smoke (the donkey-boiler used for cooking and heating makes some smoke). The maneuvring of the engines has pleased everybody.

After these trials were completed the vessel returned to the Clyde, and then moved to London making a fine run to the latter port where she was placed on exhibition. She then left for the Far East. The "Domala" and the new steamer "Modasa,"—a sister-craft,—both left the river Thames together on their maiden trips. Before they reached Gibraltar the steam-driven vessel was a day astern, which position she maintained until Suez was reached, where the vessels proceeded on different routes. Like the "Domala", she is owned by the British India Steam Navigation Co.

NEW ROUTE OPENED BY A MOTORSHIP

The new 9,400 tons deadweight motorship "Tisnaren" is being used by the Transatlantic S. S. Co. to extend its South American service to China and Japan.

OIL-ENGINE FISHING-YACHT NOW BUILDING

At the Wm. Morse Co. yard, Thomaston, Me., a fishing-yacht is being built for Wm. M. Butler of Boston. She is to be powered with a twin-cylinder 80 h.p. Bolinder oil-engine.

COASTGUARD DEPARTMENT TO CONVERT SUB-CHASER

Two 60 b. h. p. Fairbanks-Morse oil-engines are being supplied to the U. S. Coastguard at Baltimore for installation in an 110 ft. ex-submarine chaser.

BIG MOTORSHIP FOR U. S. WAR DEPARTMENT

It is the intention of the U. S. War Department to build a sea-going dredge of 3,000 horse-power in which Diesel-Electric drive will be installed. Power will be developed by six 500 b. h. p. Diesel units.

B. & W. DIRECTORS HONORED

King Christian of Denmark has conferred the Knighthood of the Order of Dannebrog on H. Blache, Chr. Overgaard and E. Bondegaard of Burmeister & Wain the Danish motorship builders, on the occasion of the 50th anniversary of the company.

CONSTRUCTION OF THE "CAMRANH" SUSPENDED

Owing to depressed shipping conditions in France the Chargeurs Reunis has given orders to suspend work on the 11,700 tons Sulzer-Diesel engined motorship "Camranh," building at the Loire shipyard, Nantes, France.

WESTERN DIESEL-ENGINE DEMONSTRATION

An interesting exhibit in operation of a 100 h.p. Western Diesel-engine manufactured by the Western Machinery Co. of Los Angeles, Cal., is being made at 44 Natonia Street, San Francisco.

ANOTHER FREIGHTER WITH OIL-ENGINE

The "Seal," owned by Capt. Frank Bevier, Seattle, Wash., is having a 60 h.p. Fairbanks, Morse oil-engine installed at the yard of the Marine Iron Works. The "Seal" is operated between Seattle and Hood Canal points.

TODD PURCHASES NEW SHIPYARD

For the extension of its ship building and ship repairing facilities, the Todd Shipyards Corporation has acquired the realty holdings of the Mobile Shipbuilding Company, at Mobile, Ala. The Todd Shipyards Corporation is the largest ship repair organization in the world, and has plants in New York, Brooklyn, Hoboken, Tacoma, Seattle. It operates a total of twenty-three dry docks, and owns the only private graving docks in the port of New York.

COMPRESSED-AIR IN DIESEL-ENGINES SHIPS

Under the above title an exhaustive paper on air-compressors was read before the North East Coast Institution of Engineers & Shipbuilders, Bolbec Hall, Newcastle-on-Tyne, England, by Wm. Reveal. Copy is before us and we presume that readers who are interested can secure copies from the Secretary of the Institution. The paper is illustrated by a number of sets constructed by Reavell & Co. of Ipswich.

SMALL OIL-ENGINES IN HOLLAND

As an indication of the popularity of this type of engine in the Netherlands the record of the number of ships built during the year 1921 in that country is conclusive. We find that 102 oil-engine installations are recorded, the total horse power being 3,929, so that the average installation works out at about 38 h.p. On Jan. 1, 1922, sixty boats were under construction having close to 10,000 h.p. American manufacturers of oil-engines of this power should take note of this record, as there is an even larger field in the U. S. A. for such motors.

FLEET OF KAHLENBERG-ENGINED GILL-NETTERS

Last year the N. J. Blanchard Boat Co., Seattle, Wash., built several gill-net fishing boats for the A. J. Denbigh Co. and they were shipped to Siberia on the motor-vessel "Kamchatka." They were destroyed by fire en route, however. The Hibbard Swenson Co. have placed an order with the Blanchard yard for a new fleet to replace them, to consist of one 26 footer with 8-10 h.p. engine, one 30 footer with 12-16 h.p. engine and six 20 footers with 4-6 h.p. engine, all being Kahlenberg surface-ignition oil-engines.

THE FIRST OIL-FIRED BOILER

Nobels, the Diesel-engine builders produced their first ship's high-powered oil-firing equipment in 1880. This was installed on many vessels at that time.

NATIONAL RIVERS & HARBORS CONGRESS

On Wednesday and Thursday, March 1st and 2nd, the National Rivers & Harbors Congress will hold their 17th Convention at the New Willard Hotel, Washington, D. C.

THE FIRST DIESEL-ELECTRIC MOTORSHIP

How many engineers recall that the first marine Diesel-electric propelling installation was fitted in the tanker "Wandal" in 1903? Three 120 b. h. p. Polar-Nobel Diesel engines with del Proposto electric transmission were installed.

KAHLENBERG-ENGINED HALIBUT BOAT

The "Convention, a combination halibut-boat and purse-seiner, owned by Antone Ulla of Seattle, Wash., has just had her gas-engine removed and a 50 h.p. surface-ignition oil-engine installed. She is now in service and saving money every day in fuel-cost.

DIESEL ENGINES FOR MINE-LAYER "HULL"

It is understood that the British Admiralty has placed a contract with Vickers, Ltd., of Barrow to build and install Diesel-engines in the new mine-layer, "Hull," (or in a mine-layer hull) which will be constructed in one of the Government dockyards.

ANOTHER BOLINDERS AUXILIARY INSTALLATION

At D. N. Kelley's shipyard at Fairhaven, Mass., the fishing-sloop "Virginia," owned by Capt. Cornelius Zegel has been fitted with a 40-50 h.p. direct-reversible Bolinders oil-engine. The "Virginia" is used for otter-trawling off the coast.

DIESEL-ELECTRIC COASTGUARD CUTTERS

Two Diesel-Electric driven vessels are being planned by the U. S. Coastguard and will be built if the requested appropriation can be obtained. One motorship will be of 2,000 shaft horsepower and will have four 600 b. h. p. Diesel-engines, and the other will have two 600 b. h. p. Diesel-engines, with electric transmission in both cases.

ANOTHER SUB-CHASER BEING CONVERTED

The Ex-Chaser No. 425, together with the original power plant, has been purchased by the Consumers Ice Company of Crisfield, Md. For a few trips in the service of this company the vessel carried ice and coal cargo, but it was found that it was commercially impossible to operate on gasolene. So the boat is at present tied-up at the owner's docks and will be changed to heavy-oil engines of the Fairbanks-Morse make in the very near future.

THE DIESEL-ELECTRIC SHIP

Before the Ocean Marine Engineers Beneficial Association at New York, Mr. W. E. Shaw of the Westinghouse Electric & Manufacturing Co. told the members that it is up to the American shipbuilders and operators to show that they are alive to their opportunities. "In the Diesel-engined ship with electric propulsion and electric auxiliaries"—said Mr. Shaw, they have available a type of ship which can beat the best that foreign shipyards had so far produced.

DIESEL MOTORSHIP IN OPERATION FOR 19 YEARS

Since 1897 the Nobel Diesel Engine Co. have built 72 different types of two and four-cycle Diesel-engines totaling over 150,000 shaft h.p., including for yachts, submarines, tankers, freighters and for various land purposes. Their first set of marine Diesel-engines constructed nineteen years ago is still propelling the motor-tanker "Ssarmat," built at the Ssormovo shipyard in 1903. The latest Nobel-engine was described in "MOTORSHIP" for Dec., 1921.

"LEVIATHAN" TO HAVE DIESEL AUXILIARY-GENERATING SETS

One of the features of the recondition specifications for putting the big steamer "Leviathan" in condition for service again is the provision for two 60 KW. Diesel-engine driven auxiliary generating-sets which it is planned to install in a deck-house way up on the first-class passenger promenade deck. Such sets could be operated until the vessel was practically below the water (should such an occasion unhappily occur) thus furnishing light, and electric power for the wireless long after the engine and boiler-rooms were flooded.

SAYS A BRITISH SHIPBUILDING MAGAZINE

Instead of being regarded as an experiment it has become recognized as a most economical procedure for a shipowner to specify that his new tonnage shall be propelled by Diesel-engines.—*"Shipbuilding & Shipping Record."*

NEW ATLAS DIESEL-TUG

The Marine Iron Works of West Seattle, Wash., is completing a new 60 ft. tow-boat for A. L. McNeeley of the Pacific Tow Boat Co. of that city. A 55 h.p. Atlas Imperial Diesel-engine has been installed, all under the supervision of L. E. Geary, of Seattle.

NEW OFFICE FOR NORTHERN FIRE APPARATUS CO.

The Northern Fire Apparatus Co. of Minneapolis, Minn., manufacturers of rotary pumps, announces the opening of their own New York City office at 51 East 42nd Street with John A. Hense as Eastern manager.

VANCOUVER HARBOR COMMISSION BOAT

The "Atkinson," a general-utility boat for harbor work, owned by the Harbor Commission of Vancouver, B. C., recently went into service. She was built by the Vancouver, Shipyards Ltd. from designs by Thomas Halliday and is powered with a 30 h.p. Penny-Porter oil-engine. She is 38 ft. long and 9 ft. beam.

CAPACITY OF MOTORSHIP "HANDICAP"

On her maiden voyage referred to elsewhere in this issue, the motorship "Handicap" left Newport, Monmouthshire, on January 10th, carrying 8,300 tons of coal and 630 tons of fuel, water and storage. Thus she was fully loaded to her 9,000 tons d.w. capacity at the time when many steamships are laid-up or going to sea half loaded. There is no boiler whatever on this ship, heating and cooking being done entirely by electricity. The main Diesel-engines are twin Sulzer-engines each of 1,350 shaft h.p. at 100 R.P.M.

OVER EIGHTEEN HUNDRED HOURS NON-STOP RUN

To the Editor of "Motorship":

I would like very much to find out how the best records of the 4-cycle Marine Diesel-engine of about 1,700 I.H.P. and using a fuel oil of about 16 degrees Baumé, compare with the record made here by a 2-cycle Diesel-engine, applied to stationary use.

The engine is rated at 1,700 I.H.P. having five cyls. 20.75-inch by 26-inch running at 180 R.P.M.

Hours run non-stop 1,873
Average load per cent. rating 82
Overloads—15 per cent. for 40 hours 25 per cent. for 1 hour and 10 minutes, 40 per cent. momentary.
Total lubr. oil in 24 hours..................3 gals.
Fuel per I.H.P. .... 0.33 lb.
Fuel used, a mixture of heavy California and Mexico petroleum.
Shut-down due to a plate breaking in air compressor valve.

As very few articles on the Diesels in your magazine make any mention of the length of time the various engines run without shutting down I will much appreciate any information you can give me on this point.

J. J. McDougall.

Globe, Arizona.

[The Diesel engine referred to by Mr. McDougall is a Nordberg-Carels built at Milwaukee, Wis., U. S. A.—Editor.]

REVIEW

Commemorative Volume of the Fiftieth Anniversary of the Incorporation of Burmeister & Wain, Copenhagen, Denmark. Published January, 1922. Printed in Danish with short history of the company in English. Profusely illustrated. 172 pages. The name of Burmeister & Wain is now almost synonymous with "motorship" and "Diesel-engine," since this firm has not only built both ships and engines in large quantity and high power, but because their early adoption of the new Diesel-power gave them an international reputation. Going back to 1872 when this firm was incorporated as a limited company this volume traces the history of the works, gives a biographical sketch of the men who have been and are responsible for the success which has been attained, and illustrates the facilities and equipment of the plant, ships, and engines, both steam and Diesel, which have been built. This book is arranged and printed in a very attractive manner.

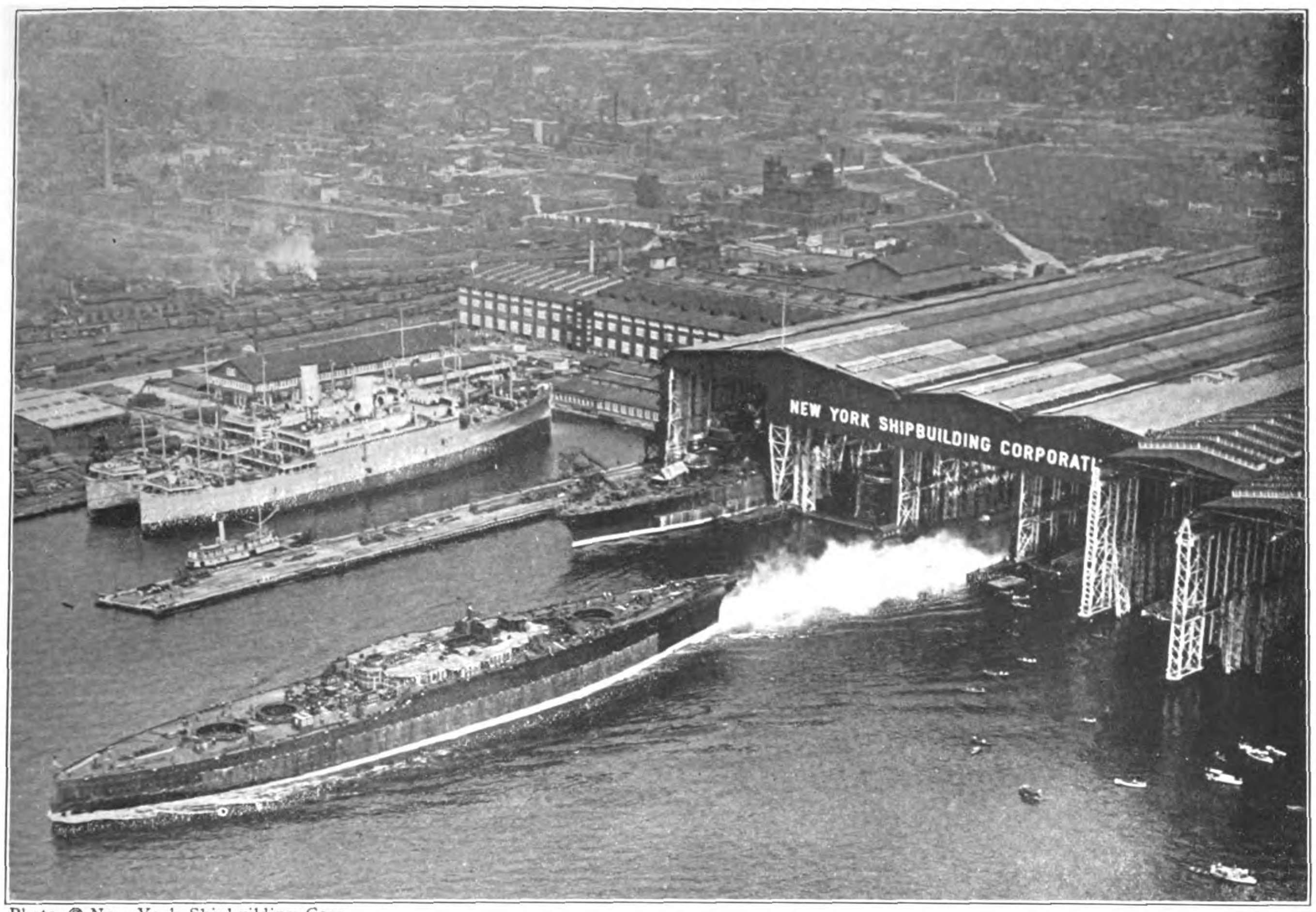


Photo. © New York Shipbuilding Corp.

Launching U. S. Battleship "WASHINGTON"

NEW YORK SHIPBUILDING CORPORATION

MAIN OFFICE AND WORKS

CAMDEN, NEW JERSEY, U. S. A.

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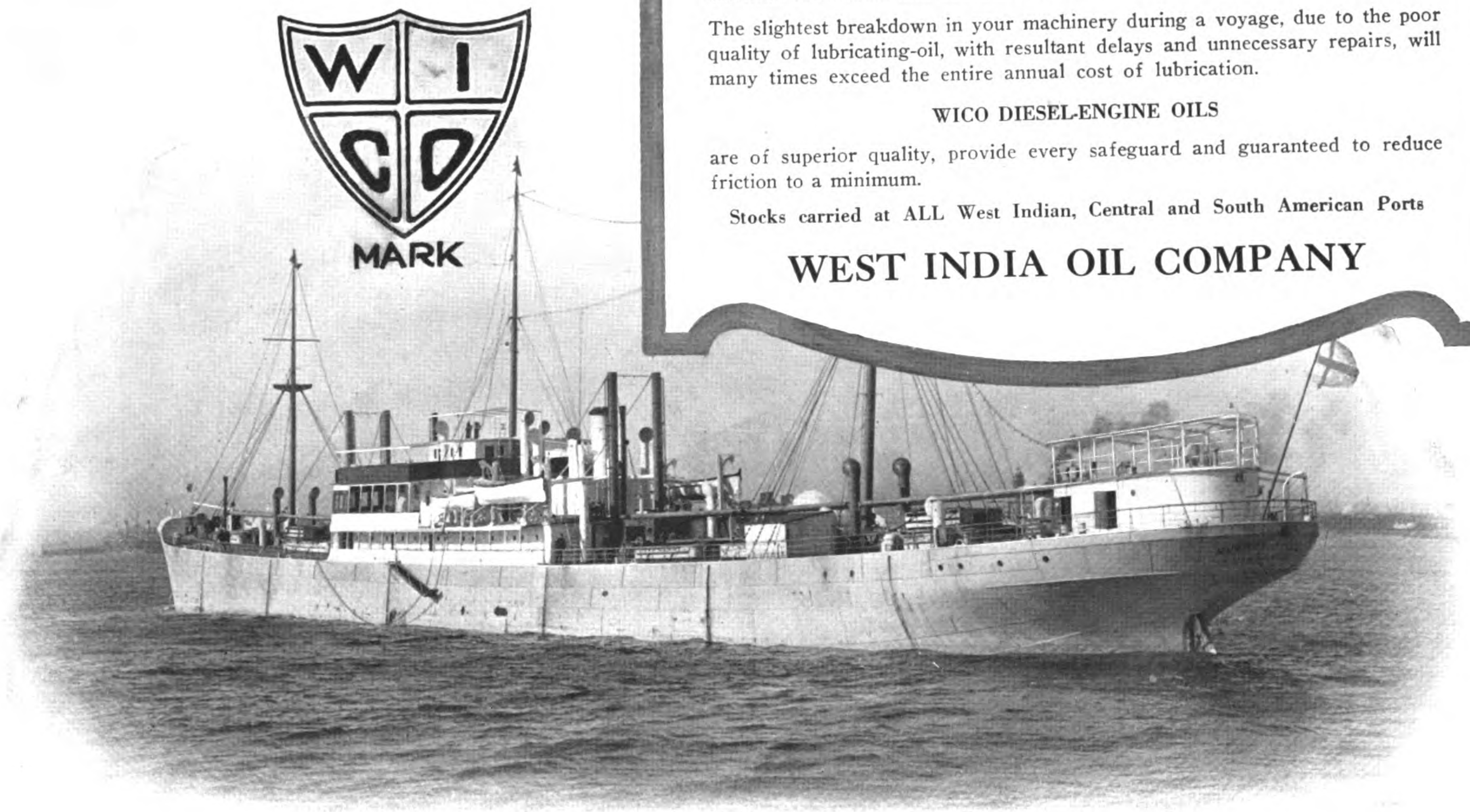

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